

UNIVERSITY OF ILLINOIS BULLETIN

ISSUED WEEKLY

VOL. XXV

JANUARY 10, 1928

No. 19

[Entered as second-class matter December 11, 1912, at the post office at Urbana, Illinois, under the Act of August 24, 1912. Acceptance for mailing at the special rate of postage provided for in section 1103, Act of October 3, 1917, authorized July 31, 1918.]

BULLETIN NO. 38

BUREAU OF EDUCATIONAL RESEARCH
COLLEGE OF EDUCATION

THE TECHNIQUES OF EDUCATIONAL RESEARCH

By

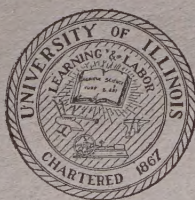
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Director, Bureau of Educational Research

and

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Assistant, Bureau of Educational Research



PRICE 50 CENTS

PUBLISHED BY THE UNIVERSITY OF ILLINOIS, URBANA
1928

The Bureau of Educational Research was established by act of the Board of Trustees June 1, 1918. It is the purpose of the Bureau to conduct original investigations in the field of education, to summarize and bring to the attention of school people the results of research elsewhere, and to be of service to the schools of the state in other ways.

The results of original investigations carried on by the Bureau of Educational Research are published in the form of bulletins. A list of available publications is given on the back cover of this bulletin. At the present time five or six original investigations are reported each year. The accounts of research conducted elsewhere and other communications to the school men of the state are published in the form of educational research circulars. From ten to fifteen of these are issued each year.

The Bureau is a department of the College of Education. Its immediate direction is vested in a Director, who is also an instructor in the College of Education. Under his supervision research is carried on by other members of the Bureau staff and also by graduates who are working on theses. From this point of view the Bureau of Educational Research is a research laboratory for the College of Education.

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College of Education
University of Illinois, Urbana

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PREFACE

The interest exhibited in the bulletin, "Reporting Educational Research," published by the Bureau of Educational Research, March, 1925, indicated that a more extensive treatment of the techniques of educational research would be welcome. With the exception of Chapter VI, Reporting Educational Research, the present bulletin consists largely of references to illustrations of research procedures. This type of treatment has been employed because it is believed that graduate students, or other persons desiring to learn how to carry on educational research, would profit more from noting the procedures employed by previous investigators than by reading an exposition of research techniques which would necessarily be somewhat abstract. There is a bibliography for each chapter except the last. However, the bibliographies for those chapters that deal with research techniques contain relatively few references. This is due to the fact that as yet there have been relatively few attempts by writers to deal with non-statistical procedures.

Mr. J. A. Clark, a former Assistant in the Bureau of Educational Research, contributed to the preparation of this bulletin by preparing a preliminary list of illustrative references which were mimeographed and placed in the hands of graduate students taking a seminar in educational research. These students contributed a number of valuable suggestions and several additional references. The authors are glad to acknowledge their indebtedness to all who have contributed to the project.

WALTER S. MONROE, *Director.*

November 2, 1927.



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THE TECHNIQUES OF EDUCATIONAL RESEARCH

CHAPTER I

INTRODUCTION

What is educational research? A brief formal definition of educational research cannot describe the many and varied activities of investigators in the field of education; it can only give an epitomized description of the general character of their activities. The following definition is given to suggest the point of view of the authors in preparing this bulletin. It is not expected that the reading of the statement will result in an adequate understanding of educational research. One who desires to understand this procedure must acquaint himself with the techniques employed in representative studies, or better engage in educational research.

Educational research is the name for a type of procedure employed in answering thought questions¹ about education; that is, questions for which answers must be manufactured by reflective thinking. This procedure is one in which the best data obtainable are used and the thinking is critical. At times a research worker may be concerned with fact questions answerable by routine clerical activities. If the answers to such questions are needed as a means of dealing with thought questions, such activities are a phase of educational research.

The ultimate purpose of all educational research is the discovery of procedures, rules, and principles relating to the various aspects of education. Or to express it in a somewhat different way, the function of educational research is to determine what we should do or attempt to do in educating children and adults. However, many of the activities of research workers have as their immediate purpose the determination of what is, or what has been, rather than what should be. This is not inappropriate provided the securing of this information is looked upon as a means for determining what should be.

The general plan of educational research. Educational research begins with the formulation of the problem, usually in the form of a

¹The phrase "thought question" is used in contrast to "fact question." As the terms are used here, a fact question is one for which there is a ready-made answer, either in the possession of the investigator or easily obtainable by him. In some instances the answer is obtainable in the required form; in others some organization or calculations are necessary. Hence, fact questions merge into thought questions and it is not possible to specify a definite line of demarcation between. In general, if the calculations are simple and routine in character, the investigator may be said to be dealing with a fact question. If the work of handling the collected information involves decisions and relatively complex calculation, the use of the adjective "thought" is justified.

concisely stated question or series of related questions. The culmination of this first step is the "definition of the problem." The second step is to collect the data that the problem calls for. This is followed by an analysis, organization, and summary of the data so as to make their meaning apparent. The final step is deriving answers to the questions of the problem from the data and expressing these answers in concise terms.

Although the procedure of educational research has been described in terms of four steps, it is not a mechanical process. No two studies are exactly alike. Variation rather than uniformity characterizes educational research. The four steps described vary in prominence. In some studies the "analysis, organization, and summary of data" is relatively simple; in others it involves elaborate and intricate statistical methods. In some cases "collecting data" is largely a clerical matter; in others it requires a highly trained investigator. However, the four steps furnish a helpful analysis of educational research.

The purpose of this bulletin. This bulletin is designed to assist the reader in understanding the techniques of educational research. A chapter is devoted to each of the four steps or phases mentioned in the preceding paragraphs. Each of these chapters begins with a brief exposition of the phase of educational research. This is followed by a list of references to reports that furnish illustrations of the techniques employed by investigators. Each reference is accompanied by an annotation that describes the technique briefly but in most cases the reader will need to consult the report in order to understand the technique fully.² In addition, there is a carefully selected bibliography in which techniques are considered. The final chapter is devoted to "reporting educational research" which is here considered as a separate phase.

Descriptions of technique in reports of research. In reporting educational research, the writer usually describes how he accomplished some phases of his work, but frequently important techniques are not mentioned. For example, in reporting a historical study it is unusual to describe the methods employed in locating the sources and the methods of handling the facts obtained. On the other hand, the report of an experimental investigation to determine the relative merits of two methods of teaching a subject usually contains a detailed description of the procedure followed in collecting the data.

²The reader should bear in mind that these reports of educational research may not be perfect. In some cases they are not in agreement with the statements by the authors of this bulletin.

BIBLIOGRAPHY

General Discussion of Educational Research

ALEXANDER, CARTER. "Opportunities for Research in Educational Finance," *Educational Administration and Supervision*, 9:209-22, April, 1923. Also in *The Phi Delta Kappan*, 5:5-8, April, 1923.

The man starting a research problem should ask himself, "Is there demonstrable need for research in this field?"—"Just what problems in it most need to be investigated, and why?"—"What methods should be used?"—"For what problems in it am I so well equipped personally that I can reasonably hope for success?" The article discusses several important problems worthy of investigation in the field of educational finance.

BAY, JAMES C. "The Training of a Research Worker in Education," *School and Society*, 25:274-78, March, 1927.

A discussion of the qualifications of the research worker is given. Some of these qualifications are "a mastery of detailed processes of analysis," "possession of definite standards of judgment," and "familiarity with materials and methods." Some of the training should comprise philosophy, mathematical analysis, statistics, and scientific attitude.

BROOKS, FOWLER D. "Criteria of Educational Research," *School and Society*, 18:724-29, December, 1923.

Seven criteria are given for the evaluation of educational research, the application of which would reveal that much so-called educational research is not research at all. The author gives a detailed analysis of typical examples of faulty technique.

CHARTERS, W. W. "Pure Research and Practical Research," *Journal of Educational Research*, 12:95-101, September, 1925.

The pure research worker may pick his problems without regard to social use. The practical investigator finds his problems "localized within practice, and in the end they must again be applied to the improvement of practice." The article closes with the listing of five steps of practical research.

Columbia Associates in Philosophy. *An Introduction to Reflective Thinking*. Boston: Houghton Mifflin Company, 1923. 342 p.

A clear knowledge of reflective thinking is essential to the research worker in any field. The investigator in education will find this book an invaluable aid in clarifying his own ideas as to the nature of reflective thinking and its use in the solution of a research problem. Chapter 13 contains a summary in which certain "tests of thought and beliefs" are given.

COURTIS, S. A., and PACKER, P. C. "Educational Research," *Journal of Educational Research*, 1:5-19, January, 1920.

An analogy is drawn between education and warfare, with the research department serving as scouts. The watchful, continuous collection of facts is called the "survey" function of educational research. The reporting of progress is designated the "appraisal" function of research. The nature of

these two functions is discussed, and the article closes with emphasis on the importance of research to education.

- CUBBERLY, E. P., DEARBORN, W. F., MONROE, PAUL, and THORNDIKE, E. L. "Research Within the Field of Education, its Organization and Encouragement," *The School Review Monograph*, Vol. 1, 1911, p. 1-54.

The rapid expansion of educational research in the last few years makes this series of articles of especial significance. At that time Cubberly indicated three major fields in need of investigation, those of finance, county reorganization, and units of cost. Dearborn and Thorndike presented pleas for experimentation and quantitative measurement, while Paul Monroe asked for coöperation in research.

- DEWEY, JOHN. *How We Think*. Boston: D. C. Heath and Company, 1910. 224 p.

The steps in the solution of a research problem are so closely those of reflective thinking, that the investigator will do well to clarify in his own mind his ideas as to the nature of the thinking process. This book may be designated as one of the classics in its field.

- HOSIC, J. F. "Assuming the Major Premise," *Journal of Educational Method*, 2:229-30, February, 1923. An editorial.

This is a protest against the practice of making hasty generalizations from insufficient data. The author emphasizes the value of suspended judgment.

- JUDD, CHARLES H. "Educational Research and the American School Program," *The Educational Record*, 4:165-77, October, 1923.

Educational research is the typical American method of solving the problem of school control. Comparisons are made between American and European methods of solving school problems. A short history of educational research is given, and the article closes with a discussion of needed investigations.

- JUDD, CHARLES H. "Research in Elementary Education," *Journal of Educational Psychology*, 17:217-25, April, 1926.

The author emphasizes the need of research in fundamentals, rather than in the details of present practice. Much of present educational research is superficial, and is characterized by routine. Some of the fields in need of fundamental productive investigations are suggested.

- JUDD, CHARLES H., BRIGGS, THOMAS H., KELLY, F. J., and COURTIS, S. A. "Research in Education," *Fifteenth Yearbook of the National Society of College Teachers of Education*. Chicago: University of Chicago Press, 1926, p. 56-93.

This is a series of four short articles which indicate the need of research in the fields of elementary, secondary, and college education. The article by Judd is the same as that given in the preceding reference. The last article, that by Curtis, is a discussion of the development of ability in research.

KELLY, F. J. "Scientific Method in College Administration and College Teaching," *School and Society*, 20:390-96, September, 1924.

The author discusses the need for educational research on the college level, particularly in the fields of evaluation of the results of college teaching, rating of college teachers, and budget making.

KOOS, LEONARD V. "Research Problems in Collegiate Education," *School and Society*, 17:169-174, February, 1923.

This is an interesting discussion of the need for educational research on the college level. "Recent opportunities for observing a large amount of classroom procedure in colleges, . . . have renewed the writer's conviction that the whole realm of method in college instruction can be made a vast field of valuable experimentation."

LIGHT, U. L. "Muddling through from Guess to Science," *Educational Review*, 68:5-9, June, 1924.

This article gives a discussion of the progress in educational practice through the development of educational research. The author concludes his article with a presentation of problems in need of investigation.

MCCALL, WILLIAM A. *How to Experiment in Education*. New York: Macmillan Company, 1923. Chapter I.

Hypothesis and experimentation are given as the third stage in the search for truth. The author states that scientific educational research may be grouped conveniently into three major divisions: descriptive, experimental, and causal investigations. The purpose of each of these types is discussed, and the nature of experimental investigations is gone into in some detail.

MEAD, A. R. "List of Possible Studies and Researches in Supervised Student-Teaching," *Educational Administration and Supervision*, 11:355-358, August, 1925.

Those interested in research in the field of teacher training will find this article of interest. Forty-eight problems are listed.

MONROE, WALTER S. "Service of Educational Research to School Administrators," *The American School Board Journal*, 70:37-39, 122, 125, April, 1925.

The reader is first given a definition of educational research. This is followed by a brief discussion of the relative merits of certain procedures. Increase in efficiency in education, and not decrease in expense, should be the goal of educational research. The article goes on with a discussion of questions in need of solution, and concludes with emphasis on the value of a critical attitude on the part of the research worker.

National Committee on Research in Secondary Education. "An Outline of Methods of Research with Suggestions for High School Principals and Teachers," *U. S. Bureau of Education Bulletin*,

1926, No. 24. Washington: Government Printing Office, 1927. 63 p.

The research worker in education will find this bulletin helpful in several ways. The need of educational research is pointed out. This is followed by a brief discussion of the nature of educational research. Qualifications of the research worker in education are outlined. The general procedures of research are outlined, and a discussion of the questionnaire is given. A brief outline is given with reference to the reporting of educational research. The next topic is a summary of suggestions and directions. The bulletin closes with a list of research agencies available to the principal and teacher.

NEWLON, JESSE H. "What Research can do for the Superintendent," *Journal of Educational Research*, 8:106-12, September, 1923.

The school superintendent should present policies to his school board which are based on the findings of educational research. The author emphasizes the importance of suspended judgment, understandable reports, and of sound philosophy in educational research.

REEDER, W. G. *How to Write a Thesis*. Bloomington, Illinois: Public School Publishing Company, 1925. 132 p.

This little book contains much information that would be of service in writing a thesis. Illustrations of certain details of form will prove useful, but the graduate student should be sure that these details are in harmony with the regulations of his institution.

THIESEN, W. W. "Recent Progress in Educational Research," *Journal of Educational Research*, 8: 301-14, November, 1923.

A discussion is given of some recent researches in such fields as testing, statistical methods, curricula, remedial measures, learning, retention, and administration. Attention is called to opportunities for further investigations.

TROW, WILLIAM C. *Scientific Method in Education*. Boston: Houghton Mifflin Company, 1925. 159 p.

The reader will find this a rather general discussion of the scientific method. The latter part of the book is devoted to the scientific method as applied to educational problems.

"What is Research?" *The School Review*, 34:488-89, September, 1926. An editorial.

The reader is told that much that is labeled educational research is merely descriptive accounts of what is going on in the high school. Some idea of the nature of real educational research may be gained from the following quotations, "True and genuine research is one of the finest performances of human intelligence and ingenuity." The title "research" should be reserved "for publications which contribute to the understanding of fundamental principles."

WOODY, CLIFFORD. "The Values of Educational Research to the Classroom Teacher," *Journal of Educational Research*, 26:172-178, October, 1927.

Research on the part of the classroom teacher is of fundamental significance to education. "Extended experiments dealing with teaching practices in their natural situations are needed." Participation in research is said to result in superior teaching, in professional growth, in understanding of current literature, in the establishment of teaching as a profession, and in certain monetary and spiritual rewards.

CHAPTER II

THE PROBLEM AND ITS DEFINITION

How should a problem be expressed? A problem should be expressed either in the form of a question or so that the question to be answered is clearly apparent. A statement of the topic is not satisfactory. It merely names the particular field in which a problem is to be formulated. The title of a thesis is usually a topic and not a statement of the problem.

The definition of a problem. To define a problem means to specify it in detail and with precision. Each question and subordinate question to be answered is to be specified. The limits of the investigation must be determined. Frequently, it is necessary to review previous studies in order to determine just what is to be done. Sometimes it is necessary to formulate the point of view or educational theory on which the investigation is to be based. If certain assumptions are made, they must be explicitly noted.

Relation of definition of problem to other phases of educational research. The definition of the problem affords a basis for the subsequent phases of educational research. It is the guide for the collecting of data. The data are to be analyzed, organized, and summarized so as to be most useful for answering the questions specified in the definition of the problem and the conclusion is merely a statement of the answers resulting from the investigation.

The basic importance of the problem and its definition indicates that they should appear early in a report of educational research. However, it is not unusual to find reports in which a large amount of introductory material precedes the statement of the problem. Occasionally this may be desirable but frequently a critical reader wonders if the formulation of this introductory material did not precede the formulation of the problem.

ILLUSTRATIVE REFERENCES

A. **Statement of the problem.** The general statement of the problem appears in several forms:

1. A question or questions:

a. A single question.

GERMANE, CHARLES E. "Outlining and Summarizing Compared with Re-Reading as Methods of Studying," *The*

Twentieth Yearbook of the National Society for the Study of Education, Part II. Bloomington, Illinois: Public School Publishing Company, 1921, p. 103-14.

After a very brief paragraph stating that there are no scientific data on the subject, the problem is stated as follows: "What is the value of making a 'corrected summary-outline' of an article as compared with re-reading the same article for the same length of time?" This is followed by a definition of "corrected summary outline" and method of experimentation.

BUTTERWECK, JOSEPH S. "The problem of teaching High School Pupils How to Study," *Teachers College, Columbia University Contributions to Education*, No. 237. New York: Bureau of Publications, Columbia University, 1926. 116 p.

At the end of Chapter I, after a discussion of several related topics, the problem is stated under the caption, "The Problem of This Investigation."

ROSEN, ESTHER KATZ. "A Comparison of the Intellectual and Educational Status of Neurotic and Normal Children in Public Schools," *Teachers College, Columbia University Contributions to Education*, No. 188. New York: Bureau of Publications, Columbia University, 1925. 51 p.

The question to be answered is on page 3, under the caption, "Purpose of the Study."

b. Several questions.

SCATES, DOUGLAS E. "A Study of High-School and First-Year University Grades," *School Review*, 32:182-92, March, 1924.

The problem is stated in the first paragraph on page 182 by means of four questions as follows: 1. "To what extent does good work in the high school predict good work in the first year of college? . . . 2. What would be the effect of raising the high school scholarship average required for admission by the University of Chicago? . . . 3. How can first year college grades be made of particular interest and value to the high school principal? . . . 4. Which first year students should be given special study by the University?"

POWERS, SAMUEL RALPH. "A Diagnostic Study of the Subject Matter of High School Chemistry," *Teachers College, Columbia University Contributions to Education*, No. 149. New York: Bureau of Publications, Columbia University, 1924. 84 p.

The problem is stated on page 3 in terms of nine specific questions the author proposes to answer.

GRAVES, KATHARINE B. "The Influence of Specialized Training on Tests of General Intelligence," *Teachers College, Columbia University Contributions to Education*, No. 143. New York: Bureau of Publications, Columbia University, 1924. 78 p.

The problem is stated on page 3 in the form of four questions.

c. A single question followed by several sub-questions.

WOODRING, MAXIE NAVE. "A Study of the Quality of English in Latin Translations," *Teachers College, Columbia University Contributions to Education*, No. 187. New York: Bureau of Publications, Columbia University, 1925. 84 p.

After a discussion of the status, time required, and objectives of Latin in the secondary schools, the problem is stated as follows:

"Do Latin students use correct and effective English in Latin translations?"

"The question immediately resolves into several related questions:

"1. What is the quality of the English used in Latin translations?"

"2. How does the English in Latin translations compare with the English in English compositions?"

"3. How effective are the words used in Latin translations?"

"4. What errors in grammar, rhetoric, and spelling occur in the English of Latin translations?"

STONE, CLIFF WINFIELD. "Arithmetical Abilities and Some Factors Determining Them," *Teachers College, Columbia University Contributions to Education*, No. 19. New York: Bureau of Publications, Columbia University, 1908. 101 p.

A general question is first asked in the opening paragraph, followed by two questions of a more particular nature.

PERRIN, H. AMBROSE. "The Local Status and Activities of General Supervision in City Schools," *Elementary School Journal*, 26:345-55, January, 1926.

At the beginning of the first paragraph, the reader is given a statement of the question followed by two sub-questions.

2. Declarative statement.

a. A single statement.

ANIBEL, FRED G. "Comparative Effectiveness of the Lecture-Demonstration and Individual Laboratory Method," *Journal of Educational Research*, 13:355-65, May, 1926.

The reader is given a direct statement of the problem in the opening sentence: "The purpose of this study was to determine scientifically through the use of objective data just how the results of the lecture-demonstration method of presenting natural science subject matter compared with the individual laboratory method of presenting exactly the same material." This sentence is followed by further definition of the problem.

HERTZBERG, OSCAR EDWARD. "A Comparative Study of Different Methods Used in Teaching Beginners to Write," *Teachers College, Columbia University Contributions to Education*, No. 214. New York: Bureau of Publications, Columbia University, 1926. 60 p.

After a brief discussion of the work of other investigators, the following statement of the problem is given at the bottom of page 2: "The purpose of the present study was to obtain results which would adequately measure the effectiveness of the direct learning method of teaching beginners to write as contrasted with the mechanical device method."

b. A single statement containing several phases.

BROOKS, FOWLER DELL. "Changes in Mental Traits with Age Determined by Annual Retests," *Teachers College, Columbia University Contributions to Education*, No. 116. New York: Bureau of Publications, Columbia University, 1921. 86 p.

After a short discussion of the work of Thorndike on the same topic, the reader is given a rather general statement of the problem:

"This investigation seeks to find out what changes in mental traits take place with age, and it seeks to find them out in the only way they can be found out accurately—by discovering what changes actually do take place in the same individuals from one year to another." This is followed by two correlated problems: "(1) to investigate the correlation between mental functions at different ages of the same individuals, and (2) to study the relation of intellectual ability to rate of improvement over a longer period of time than has heretofore been reported upon."

ALLEN, I. M. "Improving the Professional Status of Teachers," *Elementary School Journal*, 26:430-40, February, 1926.

In the second paragraph, the reader is given a statement of the problem consisting of three separate purposes.

ANDERSON, EARL WILLIAMS. "The Teacher's Contract and Other Legal Phases of Teacher Status," *Teachers College, Columbia University Contributions to Education*, No. 246. New York: Bureau of Publications, Columbia University, 1927. 180 p.

After a brief discussion as to its importance, the problem is stated on page 1 as undertaking four things.

c. A series of complete statements.

ANDERSEN, WILLIAM NICLAUS. "Determination of a Spelling Vocabulary Based on Written Correspondence," *University of Iowa Studies in Education*, Vol. 2, No. 1. Iowa City: University of Iowa, 1917. 66 p.

After a survey of existing word lists from writing vocabularies, the reader is given a statement of the problem in Chapter II under the caption "Aim." Four divisions are presented in statement form as follows:

"The aim of the present study is (1) to supplement and expand the work that has been done in the various studies, (2) to show comparatively, by extensive tabulation, the number of words that are common in the writing vocabularies of persons in various callings, (3) to show the extent and range of vocabularies used by persons in certain different callings, (4) to point out the educational significance of these findings."

JUDD, CHARLES H. "Psychological Analysis of the Fundamentals of Arithmetic," *Supplementary Educational Monograph*, No. 32. University of Chicago. Chicago: University of Chicago, 1927. 121 p.

The reader is given a statement of the problem on page 15 under the caption, "purpose of the present study," in a series of complete statements.

d. A general statement followed by subordinate statements.

HUMPHREYS, HARRY C. "The Factors Operating in the Location of State Normal Schools," *Teachers College, Columbia University Contributions to Education*, No. 142. New York: Bureau of Publications, Columbia University, 1923. 152 p.

In the first chapter, which is entitled "The Problem Stated," the reader is given a statement of three central problems: "The

central problems are: first, to ascertain the leading factors that have operated in the locating of state normal schools and teachers' colleges; secondly, to find and formulate guiding principles for the location of such institutions; thirdly, to propose certain critical standards for the locating of normal schools.

"The minor problems involved in working out the central problems are: first, a comparison of the normal schools of a state as to enrollment, number of graduates, and other factors as an indication of suitability of locations; secondly, a determination of the radii of enrollment of state normal schools in certain states as evidence of poorly located and well located normal schools."

JONES, WALTER BENTON. "Job Analysis and Curriculum Construction in the Metal Trades Industry," *Teachers College, Columbia University Contributions to Education*, No. 227. New York: Bureau of Publications, Columbia University, 1926. 104 p.

In the opening sentence of the introductory chapter, the reader is given a direct statement of the problem, followed by subordinate statements.

MEEK, LOIS HAYDEN. "A Study of Learning and Retention in Young Children," *Teachers College, Columbia University Contributions to Education*, No. 164. New York: Bureau of Publications, Columbia University, 1925. 96 p.

The reader is given a direct statement of the problem in the opening sentence of the first paragraph.

3. Statement followed by restatement in the form of a question.

KORNHAUSER, A. W. "The Economic Standing of Parents and the Intelligence of Their Children," *Journal of Educational Psychology*, 9: 159-64, March, 1918.

In the second paragraph of part I, the reader is given a statement of the problem as follows: "The purpose of the following inquiry was simply to attempt, by a brief survey, to find whether any clear indication would appear of a correlation between intelligence of children, measured crudely by school advancement, and the economic standing of the parents, measured still more crudely." After further discussion the problem is stated again in the form of a question: "Do poorer parents on the whole have less advanced children; do wealthier parents have more advanced children?"

DAILY, BENJAMIN W. "The Ability of High School Pupils to Select Essential Data in Solving Problems," *Teachers College, Columbia University Contributions to Education*, No. 190. New York: Bureau of Publications, Columbia University, 1925. 103 p.

The reader is given a statement of the problem in the first sentence of Chapter I under the heading, "The Subject and

Method of the Study." It is later stated again in the form of a question.

YOAKAM, GERALD ALAN. "The Effects of a Single Reading," *University of Iowa Studies in Education*, Vol. 2, No. 7. Iowa City: University of Iowa, 1924. 100 p.

The reader is given a statement of the problem in the opening sentence of Chapter I. At the conclusion of Chapter III, the problem is restated in the form of a question.

4. A statement followed by a series of theses.

CROW, CHARLES SUMNER. "Evaluation of English Literature in the High School," *Teachers College, Columbia University Contributions to Education*, No. 141. New York: Bureau of Publications, Columbia University, 1924. 172 p.

The reader is given a statement of the problem in the first paragraph of this study, under the heading, "Theses and Problems." It is: "To test and arrange the subject-matter in a given field, English literature in the high school, in accordance with the pupils' judgment of its values given in terms of ends that are generally recognized as socially valuable." Following this statement of the problem is a brief paragraph introducing the five theses which are to be demonstrated.

B. Definition of the problem.

1. Analysis of the major problem or problems in terms of subordinate problems.

HORN, ERNEST. "Distribution of Opportunity for Participation among the Various Pupils in Classroom Recitations," *Teachers College, Columbia University Contributions to Education*, No. 67. New York: Bureau of Publications, Columbia University, 1914. 40 p.

The problem is stated in the following sentence on page 1: "The purpose of this investigation is to discover the distribution of opportunity for participation among the various pupils in class-room recitations." It is more clearly defined by a resolution into eight subordinate problems, two of which are: "1. How equally is the opportunity for participation distributed? 2. What is the relation between the amount of reciting done and the general all-round ability of the pupil?"

ASHBAUGH, E. J. "Senior High-School English as Revealed by a Standard Test," *Journal of Educational Research*, 13:249-58, April, 1926.

The reader is given an analysis of the problem in terms of subordinate problems stated in the form of questions on page 257 in the last paragraph.

SMITH, H. P. "The Business Administration of a City School System," *Teachers College, Columbia University Contributions to Education*, No. 197. New York: Bureau of Publications, Columbia University, 1925. 129 p.

The problem is more clearly defined by an analysis into three subordinate problems. This analysis is given on page 9 of the monograph.

2. Statement of the limits or scope of study.

AYER, ADELAIDE M. "Some Difficulties in Elementary School History," *Teachers College, Columbia University Contributions to Education*, No. 212. New York: Bureau of Publications, Columbia University, 1926. 70 p.

The reader is given the limits of this study on page 4 under the heading, "Grades Selected for This Study." The last sentence of the first paragraph under this caption is the following: "However, this thesis is confined specifically to a study of fifth and seventh grade pupils' reactions to history textbook material." The study is further limited to subject matter which was intended for use in the fifth grade. The seventh grade was tested on this same material.

DAILY, BENJAMIN W. "The Ability of High School Pupils to Select Essential Data in Solving Problems," *Teachers College, Columbia University Contributions to Education*, No. 190. New York: Bureau of Publications, Columbia University, 1925. 103 p.

The purpose of this study is given in the first sentence of the opening paragraph. Immediately following this the reader is given four questions which state the scope of the study.

HUNSICKER, LILIAN MAY. "A Study of the Relationship Between Rate and Ability," *Teachers College, Columbia University Contributions to Education*, No. 185. New York: Bureau of Publications, Columbia University, 1925. 52 p.

On page 15, after a statement of the assumptions upon which the experiment is built, the reader is given a statement of the limits of the study.

3. Orientation of the problem by means of:

a. A historical account, remote or recent.

HUNSICKER, LILIAN MAY. "A Study of the Relationship Between Rate and Ability," *Teachers College, Columbia University Contributions to Education*, No. 185. New

York: Bureau of Publications, Columbia University, 1925. 52 p.

In the first chapter of this study, the reader is given a historical account of the problem which serves the purpose of orientation. This historical account is limited to a cursory review of representative types of investigations, and furnishes the reader with a clear idea of the present status of the question. The author is thus able to use this historical account as a point of departure for his own study of the problem. On page 36 under the caption, "Background," a summary of the historical survey appears.

COY, GENEVIEVE L. "The Interests, Abilities and Achievements of a Special Class for Gifted Children," *Teachers College, Columbia University Contributions to Education*, No. 131. New York: Bureau of Publications, Columbia University, 1923. 191 p.

Following the statement of the problem on page 1, and under the caption, "Historical Summary of Educational Provisions for the Gifted," the reader is given a lengthy discussion of the historical movement of special classes for gifted children.

b. A survey of previous studies or related studies.

REEVES, CHARLES EVERAND. "An Analysis of Janitor Service in Elementary Schools," *Teachers College, Columbia University Contributions to Education*, No. 167. New York: Bureau of Publications, Columbia University, 1925. 194 p.

On pages 7 to 10 under the heading, "Previous Studies of School Janitor Service," the reader is given a survey of several studies, and their results are compared and evaluated. The author uses this survey of previous studies to show that research in the field of his problem has been very meager. It also serves the purpose of introducing the definition of the problem.

REEDER, EDWIN HEWETT. "A Method of Directing Children's Study of Geography," *Teachers College, Columbia University Contributions to Education*, No. 193. New York: Bureau of Publications, Columbia University, 1925. 98 p.

Beginning with the second paragraph on page 1 and continuing through to the bottom of page 2, the reader is given a survey of several studies in the field of elementary geography. They are briefly described and evaluated.

c. An analysis of previous studies or related subjects.

BUTTERWECK, JOSEPH S. "The Problem of Teaching High School Pupils How to Study," *Teachers College, Columbia University Contributions to Education*, No. 237. New York: Bureau of Publications, Columbia University, 1926. 116 p.

Beginning with the last paragraph on page 6 and extending to the middle of page 10, the reader is given a critical evaluation of the studies of Hinsdale, Whipple, McMurray, Charters, and others. This analysis leads up to a discussion of the proper method to be used in approaching the problem.

d. Preliminary survey.

POWERS, SAMUEL RALPH. "A Diagnostic Study of the Subject Matter of High School Chemistry," *Teachers College, Columbia University Contributions to Education*, No. 149. New York: Bureau of Publications, Columbia University, 1924. 84 p.

On page 2, the reader is given a report of a brief survey of a preliminary investigation made by the author. He uses this means of introducing the hypothesis upon which he bases the statement of his problem.

4. Description of the general nature of the problem.

a. Type.

CAMP, HAROLD LAVERNE. "Scales for Measuring Results of Physics Teaching," *University of Iowa Studies in Education*, Vol. 2, No. 2. Iowa City: University of Iowa, 1922. 51 p.

Under the caption, "Definition of the Problem," the reader is given a description of its general nature. For instance, "to formulate and select exercises, the correct handling of which involves the above phases of ability." Some further idea of its general nature may be found in the discussion following the caption, "Methods of Evaluating Test Material," on page 6.

b. Source.

HAMILTON, OTTO TEMPLAR. "The Courts and the Curriculum," *Teachers College, Columbia University Contributions to Education*, No. 250. New York: Bureau of Publications, Columbia University, 1927. 168 p.

The general nature of the problem is indicated by a discussion of the sources of data given on page 2.

c. Procedure.

BUTTERWECK, JOSEPH S. "The Problem of Teaching High School Pupils How to Study," *Teachers College, Columbia University Contributions to Education*, No. 237. New York: Bureau of Publications, Columbia University, 1926. 116 p.

On page 18, near the end of a description of the experimental set-up, the general nature of the problem is made clearer to the reader by a concise statement of the procedure. The procedure is described briefly as follows: "The experiment consisted of the following: creating three groups of pupils as nearly alike as possible in those factors which form the basis of school success as conceived in the average school to-day; permitting the control group to continue its usual study procedure; giving the non-practice group a course in best methods of study; and subjecting the practice group to a series of practice material in study situations in which it was engaged throughout the year."

5. Statement of limitations of technique employed.

ANIBEL, FRED G. "Comparative Effectiveness of the Lecture-Demonstration and Individual Laboratory Method," *Journal of Educational Research*, 13:355-65, May, 1926.

The reader is given a limitation in the defining of the problem in the section entitled "Time Element" on pages 363 and 364 where the author says: "The primary object of the study being to determine the comparative effectiveness of the laboratory instruction, there was no recording of the time element."

CROW, CHARLES SUMNER. "Evaluation of English Literature in the High School," *Teachers College, Columbia University Contributions to Education*, No. 141. New York: Bureau of Publications, Columbia University, 1924. 172 p.

On page 2, under the caption, "Limitations of Study," the reader is given several direct references to the limits of the study. After stating that the purpose of the work is the defending of certain theses and the answering of certain questions, the reader is further told: "There is no attempt to take account of the method of teaching."

TEAGARDEN, FLORENCE M. "A Study of the Upper Limits of the Development of Intelligence," *Teachers College, Columbia University Contributions to Education*, No. 156. New York: Bureau of Publications, Columbia University, 1924. 112 p.

At the beginning of the second chapter, the reader is given a discussion of the limitations of the data, the nature of which

is indicated by the following sentence: "As a preface to the discussion of the selection and use of tests as measures of intelligence it should be said that perfection is not here claimed for any of our present tools of measurement."

6. Recognition of assumptions and implications.

HUNSICKER, LILIAN MAY. "A Study of the Relationship between Rate and Ability," *Teachers College, Columbia University Contributions to Education*, No. 185. New York: Bureau of Publications, Columbia University, 1925. 52 p.

In the first sentence of Chapter II, the reader is given a direct statement of the problem. Following this the "two fundamental assumptions" upon which the experiment is built are given. These are, "1. 'If a thing exists, it must exist in some amount; and if it exists in some amount, it can be measured.' 2. The relationship between rate and ability is an open question of such importance that research should not stop short of a solution that is substantiated by trustworthy, experimental evidence."

7. Importance, value, or significance of study to education.

WILLING, MATTHEW H. "Valid Diagnosis in High School Composition," *Teachers College, Columbia University Contributions to Education*, No. 230. New York: Bureau of Publications, Columbia University, 1926. 64 p.

The importance of the problem is indicated on page 2, in the discussion as to its significance.

8. Definition of terms.

HAMILTON, OTTO TEMPLAR. "The Courts and the Curriculum," *Teachers College, Columbia University Contributions to Education*, No. 250. New York: Bureau of Publications, Columbia University, 1927. 168 p.

Under the heading, "Definitions and Terms Used," the reader is given definitions of some of the words and terms used in the study. For example, the word "curriculum" is defined as follows: "The word curriculum is used in this study as a general term by which to designate all the subject matter of instruction to which the child is exposed as a result of his school experience."

BIBLIOGRAPHY

ALEXANDER, CARTER. *Educational Research*. New York: Teachers College, Columbia University, 1927. 41 p. A pamphlet.

After discussing the fields in which investigators will institute inquiries, the procedures to be used in defining a problem are suggested.

These relate to such items as originality, value, and sufficient limitation to permit exhaustive treatment.

BAY, JAMES C. "The Training of a Research Worker in Education," *School and Society*, 25:274-78, March, 1927.

The process of educational research gets under way with the formulation of a definite problem. The delimiting of the subject establishes "a criterion for judging the pertinency of data."

KELLY, F. J. "Scientific Method in College Administration and College Teaching," *School and Society*, 20:390-96, September, 1924.

This is an exceptionally sane article. It reflects a sound conception of the nature of educational research and the service which it can render. In the first two divisions of the article, the necessity of a clear analysis of the problem is stressed. This analysis should be made before the investigator begins to gather data.

MCCALL, WILLIAM A. *How to Experiment in Education*. New York: The Macmillan Company, 1923, p. 9-11.

The reader is given a brief discussion of the technique to be used in the formulation of a problem. The scope of the problem should be neither too broad nor too narrow. It is desirable that specific problems be formulated which contribute to larger investigations.

TROW, WILLIAM C. *Scientific Method in Education*. Boston: Houghton Mifflin Company, 1925, p. 38-42.

Seeing a problem is the starting point of research. The author complains that graduate students do not see problems themselves. "So they confer with some member of the graduate faculty and ask him for a problem to work on; they can't seem to think of any. Can't think of any, and the world fairly bursting with them."

CHAPTER III

COLLECTING DATA

What are data? Data include all concepts, facts, and principles used in thinking out the answers to thought questions. In other words, data are the things we use in thinking. The meaning of these statements will be more apparent if we note some of the types of data:

1. Ages of school children
2. Scores made on standardized tests
3. School marks, and other facts from school records
4. Answers to questionnaires
5. Expenditures for educational purposes
6. Assessed values and tax rates
7. Measures of school buildings
8. Statements of beliefs or opinions
9. School laws
10. Counts of things such as school children, number of pages, etc.
11. Principles
12. Descriptions of schools, events, etc.
13. Observations
14. Historical information
15. Errors in children's compositions
16. Stenographic reports of lessons

The data to be collected specified by the problem. When a problem has been adequately defined, the data needed for its solution are clearly indicated. Hence "collecting data" does not mean bringing together whatever data may be easily accessible. Instead, it means collecting the data specified by the problem.¹

Objective data versus subjective data. When data are such that there has been very little or no opportunity for them to be affected by the person collecting them, they are described as "objective." The term "subjective data" has the opposite meaning; that is, they are data of such a character that they might be affected by the prejudices, opinions, and judgment of the person collecting them.

Methods of collecting data. It is apparent from the above list of types of data that many different procedures are employed in collecting data. In general, each type requires unique techniques, and within each type the required techniques may vary according to the problem.

¹See the reference by James C. Bay, page 26.

Compiling a bibliography, a phase of collecting data. The compiling of a bibliography, which is a phase of collecting data, is seldom described in a report of educational research but the general method to be employed has been described in several places.²

ILLUSTRATIVE REFERENCES

A. Subjective data.

1. Formulation of criteria to be used as a basis for estimates.

LOOMIS, ARTHUR KIRKWOOD. "The Technique of Estimating School Equipment Costs," *Teachers College, Columbia University Contributions to Education*, No. 208. New York: Bureau of Publications, Columbia University, 1926. 112 p.

Immediately after the statement of the purpose of the problem on page 1, the caption, "Criteria," appears. Under this caption, the reader finds that four criteria are listed and briefly explained. These are: "Reliability, Adequacy, Flexibility, and Simplicity."

NANNINGA, S. P. "A Critical Study of Rating Traits," *Educational Administration and Supervision*, 12:114-19, February, 1926.

On page 114, the reader is given a list of fifteen criteria which are to be used by teachers when rating pupils.

2. Use of criteria.

KENNON, LAURA HALL VERE. "Tests for Literary Vocabulary for Teachers of English," *Teachers College, Columbia University Contributions to Education*, No. 223. New York: Bureau of Publications, Columbia University, 1926, 78 p.

The two literary vocabulary tests presented to the reader in this study were made up of two hundred words drawn largely from the special fields of English literature. Under the subtopic, "The Basis of Choice," the reader is told that "Certain considerations governed the choice of words which were considered suitable for literary word knowledge tests." The first two of these considerations may be given as follows: "1. Occurrence in a supposedly familiar or famous passage of English prose or poetry. 2. Occurrence in prose or poetry of a certain historical period included in the special field of English literature." The application of these criteria is illustrated on page 15.

²Monroe, Walter S., and Asher, Ollie. "A Bibliography of Bibliographies," *University of Illinois Bulletin*, Vol. 24, No. 44, Bureau of Educational Research Bulletin No. 36. Urbana: University of Illinois, 1927. 60 p.

B. Objective data.

1. Techniques employed in collecting.

a. Analysis.

(1) Analysis of textbooks.

STRANG, RUTH. "Subject Matter in Health Education," *Teachers College, Columbia University Contributions to Education*, No. 222. New York: Bureau of Publications, Columbia University, 1926. 108 p.

The reader is given a report of the results of a detailed analysis of the contents of a number of courses of study and textbooks dealing with health. Under the caption, "Methods of Work," the general plan of analysis is described.

LIVELY, BERTHA A. and PRESSEY, S. L. "A Method for Measuring the 'Vocabulary Burden' of Textbooks," *Educational Administration and Supervision*, 9:389-98, October, 1923.

The author describes, in the first paragraph on page 390, the method used in making an analysis of the vocabulary of textbooks. Information is given of the way of distributing the sampling in order to cover a large number of books.

MONROE, WALTER S. and CLARK, JOHN A. "The Teacher's Responsibility for Devising Learning Exercises in Arithmetic," *University of Illinois Bulletin*, Vol. 23, No. 41, Bureau of Educational Research Bulletin No. 31. Urbana: University of Illinois, 1926. 92 p.

The technique used in the analysis of arithmetic textbooks is described in Chapter IV. The problems of certain texts were classified according to type. The symbols used to facilitate the classification are given in the appendix.

(2) Analysis of pupil performances.

TOUTON, FRANK CHARLES. "Solving Geometric Originals," *Teachers College, Columbia University Contributions to Education*, No. 146. New York: Bureau of Publications, Columbia University, 1924. 114 p.

This is a report of an analysis of 2800 examination papers. On page 4 under the heading, "Analysis of Pupils' Work," the reader is told how the analysis was made.

(3) Analysis of records.

CARROTHERS, GEORGE E. "The Physical Efficiency of Teachers," *Teachers College, Columbia University Contribu-*

tions to Education, No. 155. New York: Bureau of Publications, Columbia University, 1924. 78 p.

School records and reports constitute the source of data in this study. The tables given are based on an analysis of these records, and all conclusions are drawn from them.

OJEMANN, RALPH H. "The Constant and Variable Occupations in the United States in 1920," *University of Illinois Bulletin*, Vol. 24, No. 39, Bureau of Educational Research Bulletin No. 35. Urbana: University of Illinois, 1927. 47 p.

Census reports were used as one of the sources of data in this investigation. Information is given on page 10 concerning the procedure used in the collection of pertinent facts.

b. Experimental procedures.

(1) One group method.

HELSETH, INGA O. "Children's Thinking," *Teachers College, Columbia University Contributions to Education*, No. 209. New York: Bureau of Publications, Columbia University, 1926. 163 p.

The experiment was a project in U. S. history conducted with one group of sixteen pupils, two boys and fourteen girls, classified as seventh and eighth grade. The technique employed and the conditions involved in the investigation are stated under the caption, "The Conditions and Records of the Investigation," pages 5-9.

GLICK, H. N. "The Effect of Practice on Intelligence Tests," *University of Illinois Bulletin*, Vol. 23, No. 3, Bureau of Educational Research Bulletin No. 27. Urbana: University of Illinois, 1925. 23 p.

On page 9, the reader is given information pertaining to the general plan of the experiment. It is stated that care was taken to keep testing conditions constant for the several groups. The use of the same procedure on the various groups makes this a "one group method."

(2) Equivalent group method.

Obtaining equivalent groups is one of the most important techniques of experimentation. Two general methods are employed. Frequently, an investigator selects the groups by means of random sampling or in some other way that justifies the expectation that approximate equivalents will be secured. After the selection has been made, information in

regard to the groups is sought and if it is found that approximate equivalents have not been secured, the investigator makes a re-determination of the groups or allows for the non-equivalents in interpreting his data. According to the second method, the investigator collects data in regard to the characteristics of the pupils and then builds up his group by pairing off equivalent pupils so that equivalent groups will be obtained. The reference by Odell illustrates the first method; that by Barton, the second.

ODELL, CHARLES W. "The Use of Intelligence Tests as a Basis of School Organization and Instruction," *University of Illinois Bulletin*, Vol. 20, No. 17, Bureau of Educational Research Bulletin No. 12. Urbana: University of Illinois, 1922. 78 p.

The method of obtaining equivalents used in this study is indicated by the following sentences from page 8: "These schools were divided into an experimental and a control group of four each by Assistant Superintendent A. B. Wright. In making this selection, Mr. Wright endeavored to choose two groups of schools in which the investment factors should be approximately equal at the beginning of the experiment." Dr. Odell later determined accurately the differences existing between the experimental and control schools, and he states that the differences discovered "were not large enough to invalidate the use of the two groups of schools in the experiment."

BARTON, W. A., JR. "The Effect of Group Activity and Individual Effort in Developing Ability to Solve Problems in First Year Algebra," *Educational Administration and Supervision*, 12: 512-18, November, 1926.

Under the caption, "Experimental Procedure," the reader is given a description of the method of obtaining two equivalent groups. The basis of equating used in this experiment was that of chronological age and I. Q.

ANIBEL, FRED G. "Comparative Effectiveness of the Lecture-Demonstration and Individual Laboratory Method," *Journal of Educational Research*, 13:355-65, May, 1926.

The reader is given considerable information pertaining to the methods of obtaining equivalent groups in this investigation. On page 355 it is stated: "Two classes were selected each year as groups for the experiment. . . . In order to eliminate other factors which might influence results, the two classes were balanced as nearly as possible on the basis of ability as determined by standardized intelligence tests." Further information is given on page 366: "Some students were shifted from one group to the other in order that the groups might be about equal in intelligence. After adjustment there were thirty pairs available for the experiment."

BUTTERWECK, JOSEPH S. "The Problem of Teaching High School Pupils How to Study," *Teachers College, Columbia University Contributions to Education*, No. 237. New York: Bureau of Publications, Columbia University, 1926. 116 p.

In this experiment, the reader is told that three groups of high school pupils were used. Group A constituted the practice group, Group B the non-practice group, and Group C the control group. The method of selecting and equating these groups is fully described to the reader in the third chapter under the caption, "Experimental Set-up."

- (3) Rotation method. The rotation method is a device for neutralizing the effect of unequalized factors when two or more groups are involved in an experiment.

MONROE, WALTER S. "Relation of Sectioning a Class to the Effectiveness of Instruction," *University of Illinois Bulletin*, Vol. 20, No. 11, Bureau of Educational Research Bulletin No. 11. Urbana: University of Illinois, 1922. 18 p.

On page 6, the reader is informed that two difficulties are avoided through the use of a rotation method. The first of these difficulties is that of securing equivalence between groups, and the second that of securing constancy of instruction. The rotation technique employed in this investigation is described on pages 5-7.

c. Historical.

NOBLE, STUART GRAYSON. "Forty Years of the Public Schools in Mississippi," *Teachers College, Columbia University Contributions to Education*, No. 94. New York: Bureau of Publications, Columbia University, 1918. 142 p.

In the preface, the reader is told, "I have been forced to draw my conclusions largely from data contained in the state records, in the government reports, and in a limited number of local newspapers." To support the conclusions the reader is often given quotations of brief extracts from original sources. See page 7 for several examples.

REIGART, JOHN FRANKLIN. "The Lancasterian System of Instruction in the Schools of New York City," *Teachers College, Columbia University Contributions to Education*, No. 81. New York: Bureau of Publications, Columbia University, 1916. 105 p.

Although the reader is not explicitly told the technique which is employed, a perusal of the opening paragraphs of the

study clearly reveals the fact that the technique of the research may be classed under the caption, historical. The sources of the material used in the discussion are letters, histories, reports, journals, addresses, and some current periodicals. Numerous citations from these sources are included.

d. Interview.

CHARTERS, JESSIE ALLEN. "Methods of Study Used by College Women," *Journal of Educational Research*, 10:344-55, December, 1924.

On page 345, the reader is told that before attempting to collect the data used in this investigation, "A preliminary survey was made of a group of kindly persons, . . . and by this means we developed a technique for interviewing." In the next two paragraphs, the manner of using this technique is explained and a list of the types of subjects interviewed is given. The first sentence in this explanation is the following: "Then forty-four college women were interviewed for forty-five minutes each on the average." On page 346 under the heading, "Methods of investigation," the author describes the use made of the data secured by means of the interviews.

RUFF, JOHN. "The Small High School," *Teachers College, Columbia University Contributions to Education*, No. 236. New York: Bureau of Publications, Columbia University, 1926. 145 p.

On page 10, under the caption, "Methods of Carrying Out the Study," the reader is given a list of several methods of collecting data, the most prominent of which are by personal interview with teachers and pupils.

e. Legal.

(1) Statutes.

POWERS, J. ORIN. "Legal Provisions and Regulations of State Departments of Education Affecting Junior High Schools," *School Review*, 3:280-291, April, 1925.

The use of statutes as data is indicated by the author on page 280: "The following publications were examined: (1) the school codes of various states, including all references to high schools, particularly those provisions which apply to junior high schools—"

(2) Decisions.

HAMILTON, OTTO TEMPLAR. "The Courts and the Curriculum," *Teachers College, Columbia University Contri-*

butions to Education, No. 250. New York: Bureau of Publications, Columbia University, 1927. 168 p.

Many citations from the laws and court proceedings are included in the study. For example, on page 11 a quotation from "The Illinois Supreme Court in 1881" is found defining the term "common school."

f. Questionnaire.

(1) Opinion.

STUART, HUGH. "The Training of Modern Foreign Language Teachers for the Secondary Schools in the United States," *Teachers College, Columbia University Contributions to Education*, No. 256. New York: Bureau of Publications, Columbia University, 1927. 111 p.

The questionnaire method was used in collecting the data for this study. In Chapter I, under the heading "Collection of Data," the reader is informed that the first questionnaire consisted of one hundred and eighteen questions covering all phases of the subject. The following examples taken from the questionnaire illustrate requests for opinions: "Which subjects, in your opinion, are pedagogically most suitable as minors with a teaching major in F. G. I. S?" and "What textbooks have you found best adapted to your courses on phonetics?" The questionnaires are given in the appendix.

MONROE, WALTER S., and HERRIOTT, M. E. "Objectives of United States History in Grades Seven and Eight," *University of Illinois Bulletin*, Vol. 23, No. 3, Bureau of Educational Research Bulletin No. 33. Urbana: University of Illinois, 1926. 68 p.

The questionnaire used in this investigation is given on page 9. The necessity of using judgment or opinion in giving the information desired is illustrated by the following sentence taken from the questionnaire: "V. Give below 15 *thought* questions in United States history which you think children completing the seventh and eighth grades should be able to answer."

(2) Facts.

LARSON, E. L. "One-Room and Consolidated Schools of Connecticut," *Teachers College, Columbia University Contributions to Education*, No. 182. New York: Bureau of Publications, Columbia University, 1925. 67 p.

One portion of the data used in this study was obtained by means of a questionnaire sent to teachers of one-room and consolidated schools of Connecticut. The nature of the facts obtained is indicated by the following questions: "What is your

salary for the year 1923-24?" and "What opportunities for social life do you have?"

REAVIS, GEORGE H. "Factors Controlling Attendance in Rural Schools," *Teachers College, Columbia University Contributions to Education*, No. 108. New York: Bureau of Publications, Columbia University, 1920. 69 p.

The reader is told that the facts concerning attendance in this study were gathered from the questionnaire sent to the teachers of one-teacher country schools concerning 6450 pupils of five counties of Maryland. The report sought information about the child, the school, and the community. The questionnaire and facts considered are given on pages 26-35.

ODELL, CHARLES W. "The Progress and Elimination of School Children in Illinois," *University of Illinois Bulletin*, Vol. 21, No. 38, Bureau of Educational Research Bulletin No. 19. Urbana: University of Illinois, 1924. 76 p.

One of the procedures employed in the collection of data for this investigation was the use of a questionnaire. The recipient of the questionnaire was asked to place certain *facts* in the blanks provided. The questionnaire is reproduced on page 70 of the bulletin.

g. Survey.

BURNHAM, ERNEST. "Two Types of Rural Schools," *Teachers College, Columbia University Contributions to Education*, No. 51. New York: Bureau of Publications, Columbia University, 1912. 129 p.

One of the methods employed in collecting the data for this study is implied in the paragraph entitled, "The Survey Idea." The reader is told that "The survey idea, the taking of stock of existing conditions in itemized details, is growing rapidly into wide application in various fields of human activity. This idea seems well adapted for use in a scientific study of education."

EMMONS, F. E. "City School Attendance Service," *Teachers College, Columbia University Contributions to Education*, No. 200. New York: Bureau of Publications, Columbia University, 1926. 173 p.

On page 9 is given the source of data, which consists of the 1923-24 attendance reports of fifty cities.

SMITH, H. P. "The Business Administration of a City School System," *Teachers College, Columbia University*

Contributions to Education, No. 197. New York: Bureau of Publications, Columbia University, 1925. 129 p.

Under the heading, "Source of Data," on page 8 is given a description of a survey made of business activities and school costs in each of twenty-five cities.

h. Test construction.

(1) Scale.

HOTZ, HENRY GUSTAVE. "First Year Algebra Scales," *Teachers College, Columbia University Contributions to Education*, No. 90. New York: Bureau of Publications, Columbia University, 1918. 87 p.

In Chapter II, the reader is given information pertaining to the collection of data upon which the scales were based. The author states that a set of preliminary tests were given to determine which exercises were of most value as test material and also to determine roughly the order of difficulty. With this information at hand it was possible to construct the scales.

(2) Tests.

BUSWELL, G. T. "Diagnostic Studies in Arithmetic," *University of Chicago Supplementary Educational Monograph*, No. 30. Chicago: University of Chicago Press, 1926. 212 p.

The method of formulating the tests used in this study is explained in detail from pages 88 to 100. The examples used "were constructed after a logical analysis had been made of the various factors which enter into the successive steps in the four fundamental processes."

i. Observation.

HELSETH, INGA O. "Children's Thinking," *Teachers College, Columbia University Contributions to Education*, No. 209. New York: Bureau of Publications, Columbia University, 1926. 163 p.

A brief discussion of the method of observation is to be found on page 6: "One or more observers and the critic teacher were present regularly to take notes on what was said and done during the class hour." A description of the manner of keeping the records then follows. A verbatim report of all of the daily records is included in the appendix of this study.

SYMONDS, PERCIVAL M. "Study Habits of High School Pupils," *Teachers College Record*, 27:713-24, April, 1926.

On page 714, the author gives an account of his general plan of observation. The following are two of the steps in the

procedure: "Careful and undivided attention was given to the behavior of a single boy during a period . . . Every act of the boy was entered in a notebook."

STEVENS, ROMIETT. "The Question as a Measure of Efficiency in Instruction," *Teachers College, Columbia University Contributions to Education*, No. 48. New York: Bureau of Publications, Columbia University, 1912. 95 p.

The procedure used in this study is that of observation, analysis, and criticism of actual questions in the class room. For this purpose a stenographic record of twenty lessons was secured.

2. Forms in which used.

a. Raw.

MONROE, WALTER S. "The Duties of Men Engaged as Physical Directors or Athletic Coaches in High Schools," *University of Illinois Bulletin*, Vol. 23, No. 38, Bureau of Educational Research Bulletin No. 30. Urbana: University of Illinois, 1926. 22 p.

This investigation, although of the fact finding type, is a good example of the use of raw data. Various tables are given in which the information presented is summarized. The reader will note that no statistical procedures have been employed other than that of tabulation, the determination of per cents, and the computing of totals.

WHIPPLE, GUY M. "Sex Differences in Army Alpha Scores in the Secondary School," *Journal of Educational Research*, 15:269-275, April, 1927.

The reader is given information relating to the type of data used in this investigation on page 269. "The method of analyzing this material was simply to make numerical and graphic distributions of the scores of each of these four groups for each of the eight tests of Army Alpha, and, of course, for the total score of the examination."

b. Transmuted.

ODELL, CHARLES W. "The Use of Intelligence Tests as a Basis for School Organization and Instruction," *University of Illinois Bulletin*, Vol. 20, No. 17, Bureau of Educational Research Bulletin No. 12. Urbana: University of Illinois, 1922. 78 p.

The conversion of raw data into derived is indicated by the following sentence from page 10: "The scores made upon these tests were translated into mental or achievement ages, as the case might be, and then further into intelligence and achievement quotients."

ROSS, CLAY CAMPBELL. "The Relation Between Grade School Record and High School Achievement," *Teachers College, Columbia University Contributions to Education*, No. 166. New York: Bureau of Publications, Columbia University, 1925. 70 p.

The use of transmuted data is indicated by the following sentence from page 11: "Grade-progress and age at completing the eighth grade, calculated in half-years to nearest birthday, were originally entered in actual gross scores, but were later converted into transmuted scores according to the tables given below." On page 14 the reader is given the method of transmuting letter grades into numerical ratings.

FLEMING, CECILE WHITE. "A Detailed Analysis of Achievement in the High School," *Teachers College, Columbia University Contributions to Education*, No. 196. New York: Bureau of Publications, Columbia University, 1925. 209 p.

Extensive use is made of derived data in this study. For example, it was found necessary to transmute letter marks (A, B, C, D, and E) into numerical values. The reader is given a good discussion of the techniques employed in the third chapter entitled, "Accumulation and Treatment of Data."

BIBLIOGRAPHY

ALEXANDER, CARTER. "Opportunities for Research in Educational Finance," *Educational Administration and Supervision*, 9: 209-222, April, 1923. Also in *The Phi Delta Kappan*, 5: 5-8, April, 1923.

The author stresses the value of existing data by saying, "Many of the biggest contributions in education have been made by men willing to work with already recorded data." The point made by Alexander is a good one, although the use of existing data may be over emphasized in many cases. Frequently such data is so inaccurate and so incomplete that one does not get adequate returns for his investment.

ALEXANDER, CARTER. *School Statistics and Publicity*. Boston: Silver, Burdett and Company, 1919, p. 58-71.

The reader is given a brief discussion of the methods to be used in the actual collecting of data. Certain information concerning sampling will be found to be very helpful.

ALEXANDER, CARTER. "How to Equip the School Administrator with Methods of Locating Data which will Carry Over when He is on the Job," *Teachers College Record*, 28: 890-99, May, 1927.

In this article, the reader is given an analysis and a description of a general technique for gathering data of an administrative character. It includes a critical discussion of the "school survey" method on pages 896-899.

ALEXANDER, CARTER. *Educational Research*. New York: Teachers College, Columbia University, 1927. 41 p. A pamphlet.

Six criteria are given on page 3 for the evaluation of data. Two of them are as follows: "Must be reliable enough to warrant basing conclusions upon them,"—"Must be as objective as the field of study permits."

BUCKINGHAM, B. R. "Accuracy," *Journal of Educational Research*, 8: 63-64, June, 1923. An editorial.

This consists of a discussion of the need for accuracy in the conduction of an investigation. It also tells what accuracy includes: defining terms, simplifying procedure, and giving statements of reliability.

BURRIS, W. P. "The Case Method for the Study of Teaching," *School and Society*, 15: 121-130, February 4, 1922.

This is an argument for the utilization of the case method in educational research. "The method is scientific because it is an objective and inductive study of the thing itself, and loses none of its scientific character because based upon records any more than the study of the data of a laboratory notebook ceases to be scientific when it contains a record of observed phenomena."

BUTTERFIELD, ERNEST W. "Educational Surveys," *Educational Review*, 68: 1-5, June, 1924.

This article is critical of school surveys. The point is made that a general survey interferes with the regular work of the school. The writer appears to believe that such surveys are usually conducted by people who like to meddle in school affairs.

BUTTERFIELD, ERNEST W. "The Plenary Inspiration of the Dotted Line," *Educational Review*, 69: 1-4, January, 1925.

The research worker about to employ the questionnaire method in the collection of data should be sure to read this article. It will engender in him a very worthwhile critical attitude of questionnaires and their use.

FLING, FRED MORROW. *The Writing of History*. New Haven: Yale University Press, 1920. 184 p.

The research investigator who makes use of historical data will find this book of service. The statement is made that the historian does not deal with fact but with the "residue" of fact. Such sources require careful criticism in order to establish their validity. Rules are given for the testing of evidence, and the establishment of certainty. The book ends with suggestions as to writing of history.

GOOD, CARTER V. "Careless Practices in Educational Writings," *School and Society*, 23: 684-686, May, 1926.

An argument for careful organization and reporting of bibliographical data. The author stresses the importance of good form, and gives references to certain manuals of writing.

MCCALL, WILLIAM A. *How to Experiment in Education*. New York: The Macmillan Company, 1923, p. 214-217.

Several questions are stated to guide the investigator in the formulation of a questionnaire. For example: "Are the questions unambiguous?" The different types of questionnaires which may be used to measure degree of preference are explained.

MONROE, WALTER S. and ASHER, OLLIE. "A Bibliography of Bibliographies." *University of Illinois Bulletin*, Vol. 24, No. 44, Bureau of Educational Research Bulletin No. 36. Urbana: University of Illinois, 1925. 60 p.

The research worker in education will find this bulletin invaluable when compiling a bibliography for his investigation.

PARK, ROBERT E. and BURGESS, EARNEST W. *Introduction to the Science of Sociology*. Chicago: University of Chicago Press, 1921, p. 43-60.

The reader is given a brief discussion of the nature of social problems and social research. A bibliography on page 58 gives several references to methods of sociological investigation.

RUGG, HAROLD O. *Statistical Methods Applied to Education*. New York: Houghton Mifflin and Company, 1917, Chapter II.

The chapter begins with an outline of the important sources of original educational data. This is followed by a discussion of the reliability of these sources. The chapter ends with an explanation of the method to be used in formulating a questionnaire.

SEARS, JESSE B. *The School Survey*. Boston: Houghton Mifflin Company, 1925. 427 p.

This is a rather exhaustive treatment of the technique of school surveys. It is stated that many of its procedures are those of educational research. For this reason the book should be of service to those engaged in other types of research, as well as to those about to employ the survey method. Survey is defined as "a scientific inquiry which obtains facts about the present efficiency of the school system, and on the basis of these facts offers constructive proposals for desirable improvements."

STURTEVANT, SARAH M. and HAYES, HARRIET. "The Use of the Interview in Advisory Work," *Teachers College Record*, 28: 551-62, February, 1927.

This article presents to the reader a description of the factors involved in the interview, the limitations of the interview, method of successful interviews, and includes a selected bibliography of the uses of the technique of interviewing. The reader will find this description of the technique of interviewing very helpful.

THORNDIKE, EDWARD L. *Educational Psychology*, Vol. I. New York: Teachers College, Columbia University, 1913, p. 28-42.

Information is given pertaining to several means of collecting information relative to original tendencies. Systematic observation, consensus

of opinion, and the use of the personal judgment of the author are discussed and evaluated.

TOOPS, HERBERT A. "Validating the Questionnaire Method," *Journal of Personnel Research*, 2: 153-169, August, 1923.

The author gives reasons for the disrepute of the questionnaire method. The first objection is that only a fraction of the questionnaires are returned, and these may not represent the group. The article describes a method for overcoming this objection.

WYLIE, ANDREW T. "To What Extent May We Rely Upon the Answers to a School Questionnaire?" *The Journal of Educational Method*, 6: 252-257, February, 1927.

The validity or truthfulness of the answers of a questionnaire was determined by means of other sources of information. The conclusions are drawn that the answers of any one individual are not to be given too great credence, the net total result has considerable validity, and the percentage of correct answers on the whole is high. Rules are given for the formulation and use of questionnaires.

CHAPTER IV

ANALYZING, ORGANIZING, AND SUMMARIZING DATA

Relation of analyzing and organizing data to collecting them. The analysis and organization of data depend upon the form in which they were collected. For example, when data are taken from records or printed sources, their organization may be facilitated or made more difficult by the form in which they were copied. Hence this phase of educational research overlaps that described in the preceding chapter.

Decisions to be made. The phase of educational research described as "analyzing, organizing, and summarizing data" may make great demands upon the investigator's ingenuity. There are many decisions to be made, especially in summarizing data. Typical questions are: What form of table is to be made? How large intervals should be used? How may the data be summarized without obscuring significant details? Shall one large complex table be constructed, or a group of smaller tables?

Statistical methods. Much of the handling of quantitative data is accomplished by standard statistical methods. Since these methods are described and illustrated in texts on statistics, no attempt has been made to illustrate them in the following references. However, before an average or coefficient of correlation is calculated, the investigator must make decisions. In some instances these are very simple, but frequently an experienced investigator may need to experiment before he finally decides just what calculations to make.

ILLUSTRATIVE REFERENCES

A. Transference from original sources.

DOZIER, MIRIAM. "Confidential Recommendations as a Basis for Selecting Teachers," *Journal of Educational Research*, 14: 325-355, December, 1926.

On page 326 under the caption, "Method of procedure in selecting qualities," the author gives information concerning the transferring of data from their original source, letters of recommendation, to their classified recording on eight different charts.

ROSS, CLAY CAMPBELL. "The Relation Between Grade School Record and High School Achievement," *Teachers Col-*

lege, *Columbia University Contributions to Education*, No. 166. New York: Bureau of Publications, Columbia University, 1925. 70 p.

On page 9 is shown the "cumulative record card" used in this study. Reasons are given for certain details in the form of this card. For example, entries are grouped in threes to aid in recording and tabulating. A buff card was used for boys, and a white card for girls. Other details are given which made for efficient handling of the data.

MEEK, LOIS HAYDEN. "A Study of Learning and Retention in Young Children," *Teachers College, Columbia University Contributions to Education*, No. 164. New York: Bureau of Publications, Columbia University, 1925. 96 p.

On page 3 is shown the record sheet used by the experimenters in this study. It is in tabular form, and the numbers in the "stub" of the table aid the experimenter in controlling the experiment. Space is given for remarks.

JONES, WALTER BENTON. "Job Analysis and Curriculum Construction in the Metal Trades Industry," *Teachers College, Columbia University Contributions to Education*, No. 227. New York: Bureau of Publications, Columbia University, 1926. 104 p.

A trade element chart is given on page 35 which serves the function of summarizing a portion of the data. Such a chart exhibits data in a convenient form for further classification and use.

HEILMAN, J. D. "Methods of Reporting the College Teacher's Load and Administrative Efficiency," *Educational Administration and Supervision*, 11: 167-87, March, 1925.

Information is given in regard to methods used to record data. On page 168 will be found a reproduction of one of the record blanks used.

B. Interpretation by means of graphs.

1. Frequency polygon.

STRACHAN, LEXIE. "Distribution of Intelligence Quotients of Twenty-two Thousand Primary School Children," *Journal of Educational Research*, 14: 169-177, October, 1926.

Frequency polygons are used to illustrate the distribution of I. Q. among certain groups of white and colored children. The polygons are superimposed on each other, showing the extent of variation between the groups.

WEST, PAUL V. "A Critical Study of the Right Minus Wrong Method," *Journal of Educational Research*, 8: 1-9, June, 1923.

On page 7 will be found a graph in which two frequency polygons are shown together. The method used clearly indicates the differences in distribution of the two groups.

2. Frequency curve.

KIRK, JOHN G. "Handwriting Survey to Determine Grade Standards," *Journal of Educational Research*, 13: 185, March, 1926.

The distribution in quality of one thousand specimens of social correspondence is represented on page 185. Such a smooth curve has the advantage that it eliminates some of the irregularities of the frequency polygon, and therefore better represents the true conditions of the whole body of data of which a part is represented.

3. Histogram.

BREED, F. S. and BRESLICH, E. R. "Intelligence Tests and the Classification of Pupils," *School Review*, 30: 56-57, January, 1922.

Four histograms are given in which the individual cases are represented by means of squares. The individual student may be identified, if necessary, by the numbers which appear within the square representing his scores on two tests. Certain squares are shaded to indicate displacement of individual cases. Such a figure presents graphically, and in a summarized form much more than could be gained from the context.

ABERNATHY, ETHEL M. "Correlations in Physical and Mental Growth," *Journal of Educational Psychology*, 16: 539-546, November, 1925.

The reader will find a reproduction of a histogram on cross section paper given on page 539. This might prove useful for an unpublished thesis, but is not to be recommended for a published report.

GEIGER, RUTH. "A Study in Reading Diagnosis," *Journal of Educational Research*, 8: 283-300, November, 1923.

The reader will find several examples of the frequency histogram in this article. Individual pupils are represented by numbered squares.

4. Normal curve with experimental curve.

WEST, PAUL V. "A Critical Study of the Right Minus Wrong Method," *Journal of Educational Research*, 8: 1-9, June, 1923.

A frequency polygon is given on page 3, upon which a normal frequency curve has been superimposed. This serves to illustrate that the distribution of scores, except for minor deviations, falls according to the laws of chance.

THORNDIKE, E. L. and BREGMAN, E. O. "On the Form of Distribution of Intellect in the Ninth Grade," *Journal of Educational Research*, 10: 271-278, November, 1924.

Several histograms are given in this study which are based upon experimental frequency distributions. The normal curve is superimposed on each of these, and indicates very clearly the extent of departure from normal frequency.

5. Bar graph.

FORT, L. M. "College Admission Requirements in the North Central Association," *School Review*, 31: 683, November, 1923.

The author uses a bar graph to compare the number and percentage of institutions of the East, of the West, and of the North Central Association in granting credit for certain of the newer high school subjects. The adjacent bars representing the three different classes of schools show very clearly the extent of the differences.

BISHOP, OMEN. "What is Measured by Intelligence Tests?" *Journal of Educational Research*, 9: 29-38, January, 1924.

On page 37, the reader will find an example of the bar graph. In this case it is used to indicate the difference in individual scores before and after study.

MOEHLMAN, ARTHUR B. "Child Accounting," *Journal of Educational Research*, 9: 293-304, April, 1924.

On pages 295 and 297 are given bar graphs representing the attendance and non-attendance of school children in the United States, and in the city of Detroit.

6. Scatter diagram, or correlation chart.

ROSS, CLAY CAMPBELL. "The Relation Between Grade School Records and High School Achievement," *Teachers College, Columbia University Contributions to Education*,

No. 166. New York: Bureau of Publications, Columbia University, 1925. 70 p.

On page 25 is given a scatter diagram or correlation chart which indicates graphically the degree of relationship between two sets of paired facts, average standing in first year high school, and composite score from five grade school factors.

HERRING, JOHN P. "Reliability of the Stanford and the Herring Revision of the Binet-Simon Tests," *Journal of Educational Psychology*, 15:217-223, April, 1924.

The reader is given an example of a correlation scatter diagram on page 219. It is used to show the relationship between I. Q.'s obtained by the use of two tests on the same group.

C. Summarization by means of tables.

1. Simple table.

FEINGOLD, GUSTAVE A. "Intelligence of the First Generation of Immigrant Groups," *Journal of Educational Psychology*, 15:65-82, February, 1924.

Two simple tables are given on page 70. It will be observed that a heavy line is given at the tops of tables in this journal, in place of the double line usually seen.

LESTER, JOHN A. "Spelling Ability and Meaning Vocabulary as Indications of Other Abilities," *Journal of Educational Psychology*, 16:175-181, March, 1925.

Several examples of simple tables will be found in this article. For example Table 1 shows the correlation of spelling ability with the following school subjects: French, Latin, Geometry and Algebra. The word "correlation" appears in the "stub."

2. Open table.

SIEHL, B. H. "A Survey of a Night High School," *School Review*, 31:535, September, 1923.

On page 535 will be found a good example of a simple open table. This type is useful when one has a list of items for which there is but one or two columns of figures.

RAINEY, HOMER P. "A Study of the Curricula of State Teachers Colleges," *Educational Administration and Supervision*, 11:465-472, October, 1925.

The reader will find a good example of a simple open table on page 466. Details of form should be noted.

DOUGLAS, O. B. "The Present Status of the Introductory Course in Educational Psychology in American Institu-

tions of Learning," *Journal of Educational Psychology*, 16: 396-408, September, 1925.

On page 401 will be found an example of a simple open table. On page 407 is an example of a simple open table doubled upon itself.

3. Table doubled upon itself.

WAGER, RALPH E. "Some Outcomes of the Teaching of History," *School Review*, 31: 215, March, 1923.

On page 215 will be found a good example of a table doubled upon itself. An economy of space is attained with this type of table, when dealing with a long list of items for which there are but one or two columns of figures.

4. Table with subdivisions.

PROCTOR, WILLIAM M. "The Junior College in California," *School Review*, 31: 366, May, 1923.

On page 366 will be found a table containing subdivisions, and second subdivisions. For example, under the heading "Academic Degrees," are to be found such sub-headings as "Ph. D.," "A. M.," and "A. B.," with second sub-headings "Number" and "Percentage." Columns of figures appear below these second sub-headings.

PRICE, E. D. "A Plan of Classifying Pupils," *Journal of Educational Research*, 12: 341-348, December, 1925.

On page 344 will be found a table containing subdivisions. The individual cases for the years 1918-19 and 1922-23 are subdivided into three classes, per cent promoted, per cent retained, and per cent dropped.

5. Table with varied divisions.

PROCTOR, WILLIAM M. "The Junior College in California," *School Review*, 31: 365, May, 1923.

The table given on page 365 is a good example of one containing varied divisions. The first two columns have single headings, the next two fall under sub-headings common to one heading, and the last five columns have five sub-headings under one principal heading. Such a table enables a writer to summarize a large body of data.

CHASSELL, CLARA F. "The Promotion Plan in the Horace Mann Elementary School and Kindergarten," *Educational Administration and Supervision*, 9: 445-447, October, 1923.

A table of varied divisions is given on page 446. The different grades are represented in the "stub." "Psychological tests" is subdivided into two divisions, "Educational tests" is

subdivided into three divisions, while "Citizenship scales," and "Teachers' judgments" are not subdivided at all.

BIBLIOGRAPHY

ALEXANDER, CARTER. *School Statistics and Publicity*. Boston: Silver, Burdett and Company, 1919, p. 71-89.

The efficient handling of data frequently calls for considerable judgment in deciding what procedures to use. The investigator will find this discussion very helpful in deciding the kind of cards, blanks, paper, and tables to be used in the recording of data. Information is given as to methods of summarizing and checking of items.

MCCALL, WILLIAM A. *How to Measure in Education*. New York: The Macmillan Company, 1922, Chapters XII and XIII.

Various methods of tabulation are given, along with information concerning their respective values. The form of tables is discussed, and reasons are given for the adherence to certain conventions. Chapter XIII contains a worth while discussion of graphic methods.

ODELL, C. W. *Educational Statistics*. New York: Century Company, 1925. 318 p.

Chapters I and II contain much that will be helpful to the research worker in coming to a decision as to what procedures should be used in the handling of data. Discussions are given in regard to such things as significant figures, the grouping of measures into classes, width of class interval, the frequency polygon, histogram, ogives, and smoothed curves.

RUGG, HAROLD O. *A Primer of Graphics and Statistics*. Boston: Houghton Mifflin Company, 1925. 142 p.

Information is given relative to the graphing of frequency distributions. This is followed by the application of graphic methods to such things as correlation, and the expression of a variety of statistics.

RUGG, HAROLD O. *Statistical Methods Applied to Education*. New York: Houghton Mifflin Company, 1917, Chapters III and X.

In Chapter III, the reader is given explanations of certain important phases of tabulation. The use of different types of cards, sheets, and notebooks is discussed. The chapter also contains a discussion of tabulating machines. Chapter X gives methods for the preparation of tables and graphs.

WILLIAMS, HAROLD J. *Graphic Methods in Education*. Boston: Houghton Mifflin Company, 1924. 319 p.

The second chapter contains information relative to the instruments necessary for the construction of charts and graphs. The following chapters contain many illustrative examples which should be very helpful to the novice in summarizing his data by graphic methods.

CHAPTER V

DETERMINING CONCLUSIONS

Formulating conclusions. The conclusions are essentially the answers to the questions specified in the definition of the problem. Hence, in formulating the conclusions, an investigator is merely attempting to answer the questions that have guided him throughout the research. These answers should be formulated very carefully so that they will express precisely what the writer intended to say. It may be that the data justify only tentative or partial answers. If so, the statements should clearly indicate this fact.

Hypotheses and verification. Determining conclusions corresponds very closely to two steps of reflective thinking, formulation of hypotheses and verification. In determining the answers to the questions of the problem the investigator formulates tentative statements and then compares them with the data as a means of verification. Sometimes the meaning of the data is obscure and considerable ingenuity is required to formulate a hypothesis.¹

Being scientific.² To be scientific is to know one's data and to use them with full recognition of the defects that they may possess. Hence in determining conclusions, especially in verifying tentative formulations, the investigator should have clearly in mind all the limitations of his data. It is obvious that he cannot do this unless he *knows* his data. One who has not made an extended and critical study of data is usually ignorant of their limitations. In educational research we seldom work with perfect data. Sometimes their imperfections are not significant but sometimes they are.³ The investigator is responsible for knowing his data. Failure to know them and use them intelligently means that he is not scientific.

Determining conclusions versus interpreting data. There appear to be two concepts of educational research. One of these was described in Chapter I. According to the other, the problem and its definition

¹For a discussion of the interpretation of two derived measures, see Odell, Charles W. "The Interpretation of the Probable Error and the Coefficient of Correlation," *University of Illinois Bulletin*, Vol. 23, No. 52, Bureau of Educational Research Bulletin No. 32. Urbana: University of Illinois, 1926. 49 p.

²An illustration of being scientific is furnished by Odell, Charles W. "Are College Students a Select Group?" *University of Illinois Bulletin*, Vol. 24, No. 36. Bureau of Educational Research Bulletin No. 34. Urbana: University of Illinois, 1927. 45 p. In this study the author calls attention to certain faults of his data and then shows that the nature of these faults is such that they do not seriously weaken his conclusions.

³For a discussion of errors in educational measurements, see Monroe, Walter S. "The Constant and Variable Errors of Educational Measurements," *University of Illinois Bulletin*, Vol. 21, No. 10, Bureau of Educational Research Bulletin No. 15. Urbana: University of Illinois, 1923. 30 p.

are not made basic. The data collected are not necessarily restricted to those called for by the problem. In fact, investigators who have this concept of education frequently collect data without any clearly defined problem in mind, or they may merely take data that have accumulated as a product of operating a school or engaging in some other activity. In such cases, the data are looked upon as material to be interpreted rather than used as a means of answering certain questions. As a result, we have reports of educational research that present a long list of "conclusions" which are demonstrated or suggested by the data, but which are not answers to questions raised at the beginning of the work. Although there are occasions when it is profitable to analyze, organize, and summarize accumulations, such activity is not educational research as conceived by the authors of this bulletin. Consequently, the references illustrate the determination of answers to questions rather than the interpretation of data.

ILLUSTRATIVE REFERENCES

A. Statement of conclusions.

1. Concise statements.

- a. Answers specifically connected with questions asked in statement of problem.

MADDOCKS, CARL W. "The Factor of Intelligence in School Failures," *School Review*, 35: 602-11, October, 1927.

This study gives the reader an excellent example of conclusions specifically related to the questions expressed in the statement of the problem. For example, in answer to the following question: "Is intelligence a factor in school failures?" the following answer is given: "Failure in school work indicates a low type of mentality." Another question was: "Do teachers think that inferior mental ability causes many pupils to fail?" Its answer is stated: "Teachers think that school failures are due to low mentality; this is contrary to the general opinion that teachers do not appreciate the degree of mentality of pupils, especially in the elementary schools."

POWERS, SAMUEL RALPH. "A Diagnostic Study of the Subject Matter of High School Chemistry," *Teachers College, Columbia University Contributions to Education*, No. 149. New York: Bureau of Publications, Columbia University, 1924. 84 p.

The problem is stated in the form of several related questions on page 3. The purpose of each of the next five chapters is to suggest the answer to one or more of these questions. At

the ends of each of these chapters will be found conclusions. The seventh chapter makes use of the findings of the investigation in recommending certain changes in the subject matter of high school chemistry, and in suggesting certain topics for further studies.

- b. Conclusions specifically connected to declarative statements of problems.

ANIBEL, FRED G. "Comparative Effectiveness of the Lecture-Demonstration and Individual Laboratory Method," *Journal of Educational Research*, 13: 355-65, May, 1926.

The conclusions are given to the reader in several concise statements. The problem demanded a comparison of two methods. The conclusions deal with different points of comparison such as the factors of immediate and delayed retention, the effect on brighter students, the time of presentation, and the comparative cost.

AVERILL, LAURENCE A. and MUELLER, ALFRED D. "Normal School Students in Two-Year and Four-Year Courses," *Educational Administration and Supervision*, 11: 52-55, January, 1925.

The problem is given in a single declarative statement, but it suggests several phases. Each of these phases is given a place as a topic in the body of the report. On page 54 will be found conclusions, each of which is related to one of the phases.

2. General statements.

HELSETH, INGA O. "Children's Thinking," *Teachers College, Columbia University Contributions to Education*, No. 209. New York: Bureau of Publications, Columbia University, 1926, p. 74-76.

A general interpretation of the data is given under the caption, "Conclusions." Different phases of the investigation are discussed in such a way as to bring out certain results of the study. For example, the author states that at the beginning of the year the pupils sat passively back and waited for the teacher. At the end of the year the pupils were proposing questions, looking up references for themselves, and going about the co-operative solving of problems. This discussion is summarized by four general conclusions, the first of which may be given: "Children are capable of asking and answering for themselves good questions about history."

BRUECKNER, LEO J. "The Status of Certain Basic Latin Skills," *Journal of Educational Research*, 9: 390-402, May, 1924.

After a brief statement of the limitations of data, nine general conclusions are given. Two of these may be given:

"There is a great variation in the scores of pupils on all tests for each semester's training. This is indicated by the wide range between the scores of individuals."—"The ability measured by the Godsey sentence test shows a steady increase from the second to the eighth semester."

ROSS, CLAY CAMPBELL. "The Relation Between Grade School Record and High School Achievement," *Teachers College, Columbia University Contributions to Education*, No. 166. New York: Bureau of Publications, Columbia University, 1925, p. 67-70.

The reader is given several general conclusions in which use is made of certain derived measures such as the coefficient of correlation. Two tables appear among the conclusions.

B. Statement of limitations in conclusions.

1. Recognition of limitation due to faulty or incomplete data.

CRAWFORD, C. C. "The Correlation Between College Lecture Notes and Quiz Papers," *Journal of Educational Research*, 12:282-91, November, 1925.

The reader is informed of the possibility of a fault in the data: "The reader should bear in mind that the results of these studies do not prove with certainty that the taking and reviewing on the notes caused the quiz results. It is possible that some third factor may be responsible for the correlations which have been found to exist."

GARRISON, S. C. and ROBINSON, M. S. "A Study of Re-Tests," *Journal of Educational Research*, 11:190-96, March, 1925.

A fault in the data is indicated by the following statement from the conclusions: "The results presented in this study are not typical, since the subjects had had an unusual amount of practice in taking tests before these data were secured."

HULTEN, C. E. "A Study of the Speed of Upper Grade Reading," *Journal of Educational Research*, 10:141-48, September, 1924.

The author recognizes a defect in the data by stating: "Because of the small number of subjects included, these experiments should not be considered conclusive."

2. Recognition of danger of generalization.

RUF, JOHN. "The Small High School," *Teachers College, Columbia University Contributions to Education*, No.

236. New York: Bureau of Publications, Columbia University, 1926, p. 136.

The author begins his conclusions with the following statement: "At the outset it should be clearly understood that such conclusions as are reached as a result of this investigation apply only to the five schools included in the study and not to small high schools in general." In this way the author prevents generalization on the basis of insufficient data.

COY, GENEVIEVE L. "The Interests, Abilities, and Achievements of a Special Class for Gifted Children," *Teachers College, Columbia University Contributions to Education*, No. 131. New York: Bureau of Publications, Columbia University, 1923, p. 187.

Conclusions are given at the end of each chapter. An explicit recognition of defects in the data is given in the following statement: "But the number of children enrolled in this class was too few to make it possible to generalize from these conclusions, and to say, 'These statements will hold for all children of similar intelligence, under similar conditions.' Our results show a tendency only."

ALDERMAN, GROVER H. "Improving Comprehension Ability in Silent Reading," *Journal of Educational Research*, 13: 11-21, January, 1926.

The author gives the reader the following caution in regard to generalizing on the basis of his study. "The conclusions apply in strictness only to teaching done under similar circumstances."

C. Application of conclusions.

1. Suggestions for application to practice.

IRION, T. W. H. "Comprehension Difficulties of Ninth Grade Students in the Study of Literature," *Teachers College, Columbia University Contributions to Education*, No. 189. New York: Bureau of Publications, Columbia University, 1925, p. 73-74.

Under the caption, "Pedagogic Implications," the reader is given advice concerning the application of conclusions. The following statements are made: "The study which we have reported finds its chief justification in the pedagogic applications which follow easily from the obtained results. Therefore, in concluding, it is essential that we summarize the more obvious pedagogic implications of our findings, keeping in mind the restrictions and limitations imposed by the conditions circumscribing our investigation."

STEELE, ROBERT M. "A Study of Teacher Training in Vermont," *Teachers College, Columbia University Contributions to Education*, No. 243. New York: Bureau of Publications, Columbia University, 1926. 109 p.

The last chapter of the monograph is devoted to summary, conclusions, and recommendations. The summary consists of four paragraphs in which are traced the contents of the preceding four chapters. Thirteen separate conclusions are then given, and are followed by several pages of recommendations. The reason for giving these recommendations is stated: "From the facts set forth in this study, it is clear that to regain its earlier place of leadership among the states in education and to provide the children of the commonwealth with teachers comparable in training to those in other New England states, Vermont must take immediate steps to place its teacher-training institutions upon a higher level of efficiency. To this end the following recommendations are made:".

2. Suggestion of problems for further investigation.

IRION, T. W. H. "Comprehension Difficulties of Ninth Grade Students in the Study of Literature," *Teachers College, Columbia University Contributions to Education*, No. 189. New York: Bureau of Publications, Columbia University, 1925, p. 72-73.

The investigation led to the discovery of certain problems in need of solution. Six of the most important of these problems are given. The first of them grows directly out of one of the conclusions.

ULLRICH, OSCAR A. "The Effect of Required Themes on Learning," *Journal of Educational Research*, 14: 294-303, November, 1926.

The reader is given the following statement in the conclusions which suggests further investigation: "The results of this study point to a question that seems to lie deeper than the one here investigated, that is the question of motivation of theme work—a problem which seems to demand investigation."

RUFF, JOHN. "The Small High School," *Teachers College, Columbia University Contributions to Education*, No. 236. New York: Bureau of Publications, Columbia University, 1926, p. 141.

The author does not feel justified in making any generalizations on the basis of his data other than: "It is not too much to say that this study gives additional reasons for seriously questioning the value and efficiency of the small high school in general. It clearly shows the need for further study and educational investigation of this very important part of our educational system."

BIBLIOGRAPHY

COURTIS, S. A. "The Validation of Statistical Procedure," *Journal of Educational Research*, 12:31-40, June, 1925.

The appropriateness of the statistical procedure to the situation bears a close relationship to the validity of conclusions drawn from the data. "When a non-valid statistical method is used, the conclusion reached departs from the truth to the degree to which the method is not valid." The author further states, "It goes without saying that the careful worker who reports selected data will report also the items excluded, the method of selection, and a discussion of the validity of the method."

GLICK, H. N. "Effect of Practice on Intelligence Tests," *University of Illinois Bulletin*, Vol. 23, No. 3, Bureau of Educational Research Bulletin No. 27. Urbana: University of Illinois, 1925. 23 p.

In investigations where use is made of intelligence tests it is well to consider the possibility of practice effect. Conclusions derived from intelligence scores may be erroneous unless such factors are taken into account.

MADSEN, I. N. "Intelligence as a Factor in School Progress," *School and Society*, 15:283-288, March, 1922.

MADSEN, I. N. "Anent Criteria of Educational Research," *School and Society*, 19:224-225, February, 1924.

The first reference given above is to a study which received somewhat severe criticism from Brooks.⁴ The critic states that Madsen has based his conclusions upon data from which relevant items have been excluded. Madsen's reply to his critic is given in the second reference.

MONROE, WALTER S. "The Constant and Variable Errors of Educational Measurements," *University of Illinois Bulletin*, Vol. 21, No. 10, Bureau of Educational Research Bulletin No. 15. Urbana: University of Illinois, 1923. 30 p.

In the interpretation of certain statistical data an understanding of the magnitude of the errors is essential. The research worker will find much in this bulletin to aid him in arriving at conclusions which are trustworthy.

National Committee on Research in Secondary Education. "An Outline of Methods of Research with Suggestions for High School Principals and Teachers," *U. S. Bureau of Education Bulletin*, No. 24, 1926. Washington: Government Printing Office, 1927, p. 7-8.

The procedure to be used in arriving at a conclusion is illustrated by the following quotations: "After this careful analysis comes the formation of an hypothesis or tentative conclusion. This involves freeing the mind

⁴Brooks, Fowler D. "Criteria of Educational Research," *School and Society*, 18:724-729, December, 1923.

from prejudice, so that, uninfluenced by tradition or personal bias, the tentative conclusion may be the result of the data obtained. No preconceived ideas or prejudices are allowed to have any influence. The habit of suspending judgment until all the evidence is in must be formed. Jumping at conclusions from inadequate grounds is not to be tolerated.—Nor is the research worker content with the mere statement of the tentative conclusion. Wherever possible, he attempts to find whether his hypothesis is correct by the process of validation, of trying it out in as many situations as possible to see if it works."

ODELL, CHARLES W. "The Interpretation of the Probable Error and the Coefficient of Correlation," *University of Illinois Bulletin*, Vol. 23, No. 52, Bureau of Educational Research Bulletin No. 32. Urbana: University of Illinois, 1925. 49 p.

In order to arrive at valid conclusions, a clear understanding of the manner in which probable errors and coefficients of correlation are to be interpreted is necessary. The investigator will find this bulletin of great help in that regard.

WHIPPLE, GUY M. "The Improvement of Educational Research," *School and Society*, 26:249-259, August, 1927.

After a long discussion of the futility and errors of much educational research, the author makes a plea for conclusions which are not wholly apologies. He feels that there is a limit to the number "inconclusive and merely suggestive" researches that should be published.

CHAPTER VI

REPORTING EDUCATIONAL RESEARCH¹

Reporting an important phase of educational research. The report of an investigation not only serves to record and communicate the procedure and the results but it also fulfills an important function in the process of research. In the act of writing, if it is well done, the research worker refines his thinking and the detailed record facilitates the critical testing of the work done. Thus an investigator should not consider that he has completed his task until a complete report has been prepared. If he is interested in communicating his work to others, the report must be well written in order to fulfill that purpose effectively.

The communicatory function of a report of educational research. Usually, in preparing a report of a study, a research worker should not confine his purposes to "telling" the reader the answer that he has obtained to the problem studied.² Instead, he should try to guide the reader to think about the problem in such a way that at the conclusion of his reading a dependable answer will have been attained. Thus a complete report of an investigation should guide the reader (1) to define the problem clearly so that he will understand just what questions are to be answered and in some cases their relation to other questions, (2) to understand the data introduced, especially to be aware of their limitations, and (3) to test critically the hypothesis which is to be accepted as the answer and as a result to qualify or limit it if the data indicate that this should be done. In case other hypotheses are likely to occur to the reader, the discussion should guide him to an understanding of the reasons for their rejection.

I. CRITERIA FOR JUDGING OR PLANNING A REPORT OF EDUCATIONAL RESEARCH

The criteria or rules that should be recognized in planning a report of educational research or in evaluating a report are stated in question form in the following summary. Preliminary to an attempt to apply these criteria a writer should seek a clear understanding of them by

¹This chapter is reproduced with minor changes from: Monroe, Walter S. and Johnston, Nell B. "Reporting Educational Research," *University of Illinois Bulletin*, Vol. 22, No. 38, Bureau of Educational Research Bulletin No. 25. Urbana: University of Illinois, 1925. 63 p. This bulletin is now out of print.

²There may be occasions when an abbreviated report should be made. For example, in an oral presentation it is undesirable to give a large number of details and one may appropriately ask his audience to assume that the technical procedure was satisfactory or at least to take his word for it. On such occasions, it is also undesirable to present the details of one's data.

reading the explanation which follows. The topics listed under "development, evaluation, and organization of ideas" are somewhat intangible and are probably the most difficult to apply effectively, but they are important and therefore should be given especial attention.

Summary of Criteria

A. General Structure of a report.

1. Major divisions.

a. Are the following divisions reasonably explicit: definition of problem, collection of data, treatment of data, discussion of each question to be answered, and the conclusion?

2. Introduction.

a. Is the problem introduced in such a way that a competent reader will understand and appreciate the purpose of the report?

b. Has superfluous material been eliminated from the introduction?

3. Definition of problem.

a. Is the reader given a precise statement of the questions to be answered?

b. In case the problem is related to other problems, are the relations made clear to the reader?

4. Conclusion.

a. Is the reader given in convenient form an explicit answer to each question included in the "definition of the problem"?

B. Development, evaluation, and organization of ideas.

5. Trend of thought.

a. As the reader "traces" the writer's thinking, will he be led from a clearly defined problem to a critical and scholarly answer by a route that is satisfying to him?

b. Is an encyclopedic enumeration of ideas or facts avoided?

6. Development of ideas.

a. Has the writer avoided leaving "gaps" in his "trend of thought" for the reader to fill in?

b. Have the important ideas been "developed" so that the average reader will fully comprehend them?

c. Has the writer developed his ideas so completely that no points have been overlooked which might leave the reader with unanswered questions?

7. Evaluation of ideas.

a. Have all irrelevant ideas been eliminated?

b. Have the ideas been grouped properly with reference to their relative importance?

8. Accuracy of interpretation.

a. Have the data been accurately interpreted?

b. Do the statements agree with generally accepted opinion and "common sense"? If not, is attention called to such disagreements?

9. Precision of statement.

a. Are the statements made so that they will convey to the reader exactly the meaning intended?

b. Are all statements worded so that ambiguity or indefiniteness is avoided?

C. Details of structure and form.

10. Diction.

a. Have appropriate words and phrases been used at all times?

b. Have particular words and phrases been used with a consistent meaning?

c. Have words and phrases to which common practice has assigned technical meanings been used correctly?

d. Has attention been called explicitly to each word or phrase used with an unusual or restricted meaning?

e. Has the "over-working" of certain words been avoided?

11. Clearness.

- a. Is the vocabulary suitable for the intended audience?
- b. Are the ideas expressed in simple yet definite language?

12. Rhetoric, grammar, spelling, and punctuation.

- a. Have the rhetorical rules relative to unity, coherence, and emphasis in sentence and paragraph construction been properly observed?
- b. Have rules of grammar been observed?
- c. Are all words correctly spelled?
- d. Has consistency in the plan of punctuation been observed?

13. Form of tables and graphs.

- a. Are the captions of tables at the top and those of graphs at the bottom?
- b. Are the captions, box headings, and other labels sufficiently complete so that a competent reader will be able to understand the table or graph without referring to the accompanying text?

14. Explanation and interpretation of tables and graphs.

- a. Has the enumeration of the facts summarized in a table or diagram been minimized in the accompanying text?
- b. Is the accompanying text sufficiently complete so that it is unnecessary for the reader to refer to the table or diagram in order to follow the trend of thought?
- c. Are references to tables and graphs sufficiently explicit so that the reader will have no difficulty in locating the correct table or graph?
- d. In interpreting a table or graph, is the introduction of irrelevant facts or comments avoided, so that the trend of thought is not broken?

15. References to sources of information.

- a. Are bibliographical references given for statements or facts taken from the works of other persons?

16. Bibliographical form.

- a. Are all references both in footnotes and in bibliographies given in an approved bibliographical form?

17. Chapter titles, table of contents, preface, title page, order of paging, spacing, kind of paper, and so forth.
 - a. Have conventional rules with reference to chapter titles, table of contents, and so forth been observed?
18. Footnotes.
 - a. Have footnotes been used to give needed explanations or other comments which will make more certain a correct and complete understanding by the reader?
 - b. Has material which would tend to break the trend of thought but which is desirable to include been placed in a footnote or in an appendix?
19. Miscellaneous.
 - a. Have conventional rules with reference to abbreviations, division of words, spelling out numbers, and so forth been complied with?

II. DISCUSSION OF CRITERIA

1. **Major divisions and their sequence.** No general rule can be stated with reference to dividing a report into chapters or other sections. Usually there is an introductory section or chapter in which the problem and its discussion are introduced to the reader. Either as a part of the "introduction" or as divisions coordinate with it, there should be a "definition of a problem" and a statement of the "sources of data" and "plan of treatment." Sometimes a general statement is made in regard to the "limitations of the data."

The plan of the "discussion of the problem" will be determined largely by the way in which the problem is defined. Usually there should be a distinct division for each major subordinate problem or question. For each problem or question there should be an explicit conclusion. Sometimes these may be placed at the end of the respective chapters or sections, but in lengthy reports it is desirable to set apart a final chapter for this purpose.

In short manuscripts (twenty-five pages or less) it is not customary to label the sections except by a paragraph or center heading, but a critical reader should always be able to identify them without difficulty. When a manuscript includes as many as fifty typewritten pages double-spaced, it is customary to form chapters or sections and to label each with an appropriate title.

2. Introduction. The purpose of the "introduction" is to acquaint the reader with the problem under consideration so that he will both understand and appreciate the purpose of the following discussion. In introducing a problem, the writer may tell how it arose and discuss briefly its importance, but if it is already familiar and of immediate interest to the audience addressed this phase of the introduction should be omitted or at least made very brief. In general, the introduction should contain such explanatory statements as are judged necessary to put the reader in the proper frame of mind for the understanding of the material that follows. It is, however, not possible to specify the portion of a report which may properly be devoted to an "introduction." In case the section so labeled includes, in addition to a statement of the writer's purpose, a description of the sources of data and of the plan of treatment and some comment upon the limitations of the data, it may extend over several pages. On the other hand it may be relatively short. A good rule to bear in mind is that as soon as the reader understands the problem, he probably will be interested in what the writer has to say about it and will be inclined to resent an unnecessary delay.

3. Definition of problem. An effective way to define a problem is to state in precise terms the specific questions to be answered. If it is thought desirable, explanation and comment may be added. If there are closely related questions that are not to be considered, it is sometimes helpful to point these out.

4. Conclusion and summary. A reader should always be able to find at the end of the manuscript or at the end of the major divisions a brief statement of the answers to the questions stated in the definition of the problem. If answers are to be given for a large number of questions, they should be organized by grouping and subordination so that the reader will not be bewildered by an encyclopedic enumeration of statements. Furthermore, the conclusion should be confined to a statement of the answers to the questions being considered.³

5. Trend of thought. The phrase "trend of thought" is used as a name for a somewhat subtle and indefinite concept. It is, however, implied in a writer's purpose with reference to his readers. The sentences and paragraphs which the writer sets down are for the purpose of rendering maximum guidance and assistance to a reader in thinking from the problem defined to its solution. The writer has thought through the problem and he is writing for the purpose of guiding the reader also in thinking out the same answer. This does not mean that the writer should describe his actual mental processes in thinking out

³See page 7.

his solution. Frequently his thinking involves much "scrapped thought," and he should endeavor to guide the reader so that such waste will be eliminated. Therefore, the writer should rearrange his thinking about the question so that the reader's thinking will be as efficient as possible.

The organization of one's writing should be such that the reader will progress through the several phases or steps of reflective thinking: defining the problem, gathering data or information, forming hypotheses, and verifying them. The writer should keep the problem or a subdivision of it before the reader. Ideas should be presented to him at the time he needs them. When he has been guided to the solution which the writer wishes him to reach, he should be led to examine it critically.

Many qualities enter into a trend of thought. There must first be a good general organization; then the rules of unity and coherence must be observed in each paragraph and sentence. All irrelevant material must be excluded. Good writing is not a series of isolated or unconnected statements even though each one itself may express an important idea or principle.

6. Development of ideas. Many writers tend to abbreviate. Important ideas are mentioned incidentally or merely alluded to, and in some cases, omitted altogether. It thus becomes necessary for the critical reader to fill in the "gaps" in the thinking if he is to avoid a feeling of incompleteness. In such a case the writer has failed to fulfill his function in guiding his reader to thinking fully and clearly about the problem under consideration.

Words and phrases are used as symbols for ideas. Such phrases as "supervised study," "divided period," "individual instruction," "motivation," "curriculum," and "intelligence" occur frequently in educational writings and are intended to stimulate in the mind of the reader certain ideas. One person's concept of "supervised study," for example, is likely to differ from another's in wealth of associations and in richness of meaning, even when there is no actual disagreement. Because a writer has spent some time in formulating, enriching and organizing his concepts, he is very likely to attach to the symbols used a richness of association and meaning much greater than that stimulated in the mind of his reader, unless he "develops" his concepts by explicit references to associated ideas and by appropriate illustrations.

7. Evaluation of ideas. In thinking about a problem⁴ many ideas may come into the mind of the writer. Some are pertinent to the problem; others are not. If extraneous ideas are introduced into the dis-

⁴This includes any reading on the problem which the writer may do.

cussion, the reader's attention is likely to be distracted from the main issue. It is not sufficient to reject only those ideas which are erroneous or unimportant in general. An idea may be very useful in connection with one problem but have little or no value in the treatment of another. Good writing is not merely recording good ideas. It is rather the recording of ideas which are good for a particular purpose. One of the difficult tasks of a writer is to stick to his text. His prejudices in favor of certain ideas constantly tempt him to introduce topics which have little or no connection with the problem.

The proper subordination of ideas is also important. As has been pointed out, the writer should seek to build up a "trend of thought." The effectiveness of the ideas included in this "trend of thought" depends upon the organization in somewhat the same way that the convenience of a house depends upon the arrangement of the several rooms. There should be a few principal ideas and all others should be subordinated to these. The reader will then be given a few major points which will serve as organizing centers for the related ideas.

8. Accuracy of interpretation. The writer is responsible for knowing his data. If they are not representative or if they are subject to errors or other limitations he must qualify his statements accordingly. He should make certain that his data justify a statement before he makes it. He should also check it against generally accepted beliefs and "common sense." Even when he is satisfied in regard to its accuracy, he, in many cases, should call the reader's attention to any disagreement with beliefs or statements by other writers and should indicate the basis of his judgment. In the absence of such explanation the critical reader may judge the statement to be inaccurate and conclude that the writer has been careless in his thinking.

9. Precision of statement. A precise statement conveys exactly the meaning intended by the writer. When read carefully by a competent person there is no uncertainty in his mind. He is not left in doubt on any point. He is not confused. He has no questions to ask about what the writer intended to say. It is obvious to him that the writer has very clear, definite and precise ideas to express. A precise statement usually includes limitations and restrictions which should be kept in mind. The words used have been selected with a view to the precise shades of meaning which they convey.

Lack of precision may be due to (1) poor choice of words, (2) faulty usage of technical terms, and (3) omission of restrictive words and phrases.

The following brief quotations from "educational writings" have been carefully selected to illustrate the lack of precision of statement.

However, the reader should realize that these excerpts may lose much of their effectiveness as illustrations by being abstracted from the setting given them by their authors. The first quotation illustrates the effect of the choice of words upon the precision of statement:

In selecting drill material in reading, methods can be determined by a wise manipulation of reading tests.⁵

The words, "method," "wise," and "manipulation" are poor words to use in this sentence. The following sentence expresses more clearly and precisely what the author appears to have had in mind:

The use of reading tests designed to reveal the specific deficiencies of children is helpful in selecting drill material in reading.

A second illustration is:

To overcome in a single grade the heterogeneous grouping of children from the standpoint of mentality, various administrative devices have been employed with varied degrees of success. Two of these devices, teacher's estimates of pupil's work, and mentality tests stand out prominently.⁶

In this statement one is confused because "teacher's estimates of pupil's work," and "mentality tests" are called administrative devices which overcome the heterogeneous grouping of children. They are not devices of this sort. They are rather instruments for securing information, which in turn may be used as a basis for grouping the children belonging to a single grade.

A considerable technical vocabulary has gradually been built up in the field of education. Many words which were already in use have been assigned very definite meanings. Failure to use such words in accordance with the technical meanings assigned to them greatly reduces the effectiveness of one's writing. The word "standard" is very frequently used incorrectly. For example:

In measuring certain educational products there too must be a standard corresponding to the many commercial standards. It is not for us here to question how educational standards are obtained.⁷

It appears from what follows that in the second sentence this writer is using "standard" in the sense of "norm." In the first sentence it obviously has the meaning of "standard unit" such as a standard yard, or a standard pound. Hence, the meaning of the quotation is not clear, and the reader is likely to be confused or misled. It is probable that the writer failed to think clearly.

The quotation below illustrates the securing of precision through the use of restrictive terms:

In this chapter we shall not rehearse the facts concerning the boys and girls of *fourteen or fifteen* which are available in books on the psychology of

⁵Paulu, E. M. *Diagnostic Testing and Remedial Teaching*. New York: D. C. Heath and Company, 1924, p. 22.

⁶*Ibid.*, p. 58.

⁷*Ibid.*, p. 28-29.

childhood and adolescence, but shall report three studies which add new information concerning the *select* group of boys and girls who *enter American* high schools.⁸

The words printed in italics add greatly to the precision of this statement. Their value becomes apparent when the statement is re-written as follows:

In this chapter we shall not rehearse the facts concerning boys and girls which are available in books on psychology, but shall report three studies which add new information.

The following is an illustration of a paragraph which adds to the precision of the chapter in which it appears:

Care must be taken, however, not to leave the impression that the increased expenditure per child of school age means merely an increased cost of an identical service. During this period the public school system of the state has not only attracted and held in school a larger part of the children of school age, but it has expanded its "program" by establishing a more varied and elaborate curriculum, and additional service such as transportation of children, health service, kindergartens, vocational and continuation schools.⁹

This paragraph serves to direct the attention of the reader to the avoidance of a conclusion which otherwise might be inferred from the figures just cited. It is also an illustration of precise writing. The words have been chosen carefully in order to convey exactly the meaning intended. Evidently the writer thought that the word "program" might not convey a sufficiently definite meaning and for this reason he has defined it.

It is obvious that precision in thinking is a prerequisite for precision in expression. It would be only accidental if one wrote precise sentences and paragraphs when he did not have precise ideas to express. On the other hand it is not generally realized that faulty usage of technical terms, omission of restrictive expressions, and even a poor choice of words and phrases constitute evidence that the writer has failed to think clearly and precisely. There may be exceptions but in general this may be accepted as an empirical rule.

10. Diction. Although "general structure," "trend of thought," "development of ideas," and so forth are potent in determining the quality of a report, a writer cannot communicate his ideas effectively unless he uses appropriate words and phrases. Some words that are used with only a general meaning in conversation and in non-technical fields have been assigned precise meanings in the field of education. Examples of such words are: standards (in educational measure-

⁸Thorndike, E. L. *The Psychology of Algebra*. New York: The Macmillan Company, 1923, p. 1. The italics have been inserted by the authors of this bulletin.

⁹Strayer, George D. and Haig, Robert M. *Financing of Education in the State of New York*. New York: The Macmillan Company, 1922, p. 138.

ments), intelligence, objectives, content, correlation, project, diagnosis, supervision and motivation. Other words and phrases have been coined to represent ideas: junior high school, project method, achievement test, power test, supervised study, divided period, Dalton plan, and so forth. A writer's skill in choosing verbs, adjectives and adverbs also is very potent in determining this quality of his writing. Fine shades of meaning cannot be expressed unless appropriate words are used.

As a rule a writer should use a word or a phrase only as a symbol for the meaning usually given to it. If he finds it necessary or desirable to modify this meaning, he should call the reader's attention to the restricted or changed meaning. Usually such explanatory comments should be given in a footnote and the reader may be reminded of the modified meaning by enclosing the word or phrase in quotation marks whenever it appears.

It is highly important that a writer be consistent in his use of terms. Any inconsistency will be annoying to the reader and may make it impossible for him to understand what has been written. Furthermore, lack of consistency in the use of terms and phrases is usually evidence of careless or superficial thinking about the problem being discussed.

Frequent recurrence of a word or phrase should be avoided. No term should be over-worked. No definite rule can be stated, but in general a writer should endeavor to avoid the repetition of the same word or phrase in a short sentence or in successive short sentences.¹⁰ This rule is especially important in the case of an emphatic noun or verb.

11. Clearness. The function of a report is to stimulate in the mind of a reader certain definite ideas. If these ideas are not impressed upon him, if he misinterprets what is said or is left in doubt, the writer has failed either in his own thinking or in his medium of expression. This vital principle of clearness is the starting point for any sound treatment of a subject. Every good style is essentially a clear style. Good writers vary in their forms of expression. They may have, and usually do have, certain peculiarities, but they have in common the one aim of presenting their material in such a way that a reader is not troubled by the slightest obscurity or irrelevance.

Often it is necessary, in addition to making the exposition clear, to make it interesting. Initial interest is secured by the way in which the problem is introduced. Holding the reader's attention is dependent

¹⁰This general rule does not apply to the more common prepositions, conjunctions, etc.

upon the manner in which the discussion of the problem is handled. Irrelevant statements tend to hinder the reader in getting the meaning. The presence of too many ideas is likely to be distracting and confusing. Verbosity on the part of the writer makes the reading laborious. On the other hand, if the statements are too bare, if the writer assumes too great knowledge on the part of the reader, the ideas will not be fully grasped nor appreciated. Unfamiliar material or abstract statements should be clarified by the use of illustrations or examples. Statistical data often are confusing unless skillfully presented in tables or diagrams. No rule, of course, can be laid down. Each writer must decide whether, considered from the standpoint of the average reader, the particular statement which he makes needs elucidation or will be made more effective by illustration.¹¹

Anything which is of use in increasing the interest of the reader is justified, but anything which is mere ornamentation is to be condemned.

12. Rhetoric, grammar, spelling, and punctuation. The authors of this bulletin have not attempted a systematic or a complete treatment of rhetoric, grammar, spelling, and punctuation. The following discussion is limited to a few rules which, judging from our experience, are frequently violated in the kinds of educational writing referred to in this bulletin. For complete and authoritative treatments of rhetoric and grammar the reader is referred to the following manuals:

GREEVER, GARLAND, and JONES, EASLEY S. *The Century Handbook of Writing*. New York: The Century Company, 1919. 228 p.

LEONARD, ARTHUR W., and FUESS, CLAUDE M. *Good Writing*. New York: Harcourt, Brace and Company, 1922. 314 p.

MANLY, JOHN M., and POWELL, JOHN A. *A Manual for Writers*. Chicago: University of Chicago Press, 1913. 225 p.

MANLY, JOHN M., and RICHERT, EDITH. *The Writer's Index*. New York: Henry Holt and Company, 1923. 261 p.

WOODS, GEORGE B., and STRATTON, CLARENCE. *A Manual of English*. Garden City, New York: Doubleday, Page and Company, 1926. 265 p.

Paragraph construction. A paragraph should be restricted to the presentation of a single central idea and very closely related subordinate ideas. It should represent a unit of a writer's discussion, and should embody unity, coherence, clearness, and emphasis. Its central idea in all cases should be apparent to the reader, and sometimes should be expressed in the first sentence. A paragraph should never close with a weak ending.

¹¹Many successful writers have testified that they secure a great deal of help from reading aloud from some good writer. In this way they are able to get the "feel" of the style of the author. One successful young writer made it a practice before beginning the writing of an article to read aloud from the works of William James. He did this not for the purpose of understanding James but rather for stimulating in his own thinking a flow of words which would have the quality of force and beauty as well as of clearness.

No rule can be stated in regard to the length of a paragraph, but in general long paragraphs should be avoided. It is seldom that paragraphs exceeding 200 to 250 words in length are really good. The poor structure is not due to the length of the paragraph but rather to the fact that many writers, particularly amateurs, begin a new unit of thought by the time they have written in excess of 200 words.

Sentence construction. The essentials of a sentence are good connection, good organization, and correct grammar. The untrained writer frequently finds it difficult to attain good sentence structure. Faults of grammar usually can be corrected with comparatively little effort, but practice is necessary in order to secure good organization. Frequently it is necessary to divide sentences, to twist them about, to join or to condense them, and in some stubborn cases to make a complete reconstruction.

Punctuation. The main rules of punctuation regarding the more important uses of the period, comma, and so forth are well-fixed and accepted by all authorities and should be carefully observed in sentence structure. However, a variety of usage exists concerning minor points. Certain persons and publishers tend to punctuate freely, others sparingly. Each writer should decide regarding the method of punctuation he wishes to adopt and should be consistent throughout his manuscript in the use of that method. He should keep in mind that punctuation depends upon meaning; some marks are essential to clearness; others, though not essential, are helpful; and all which do not aid in making the meaning clear should be avoided.

13. Form of tables and graphs. (a) **Tables.** Statistical data usually should be presented in tabular form with a specific heading. Occasionally when the data are simple and do not occupy more than three or four lines, they are presented informally without a heading; but this practice is to be discouraged.

The construction of good tables is difficult and few general rules can be given that will apply in all cases. Frequently, it will be necessary for the writer to exercise his ingenuity in order to set up good tables. As a guiding principle he should bear in mind that a table should be easily read and should present the data effectively. Also he should consider the available space on the page, and unless the presentation of the data will be weakened, he should confine the table to a single page of the manuscript. Extremely large tables often can be avoided by breaking them up into two or more separate ones. Each table should have its title or caption and both the general heading and the subordinate headings should be sufficiently explicit so that the table can be understood without reference to the accompanying text.

The caption of a table is usually written in all capitals with no punctuation mark at its close. (See Table I.) If there is a sub-title, it is placed on the line below the main title and written in capitals and small letters. (See Table IV.) When a second sub-title is considered necessary, it should appear, usually in parentheses, below the sub-title.

Tables should be numbered with Roman figures consecutively throughout the manuscript. The number followed by a period precedes the caption and appears on the same line.

Careful attention should be given to the various box heads (headings and sub-headings) of the different divisions of the table. Horizontal double lines are placed at the top of the table, a horizontal single line at the bottom, and no vertical lines at the sides. Within the table, vertical lines are placed between the columns of data; horizontal lines are seldom used except to mark off important divisions as in the box headings or to set off totals. Perpendicular double lines should be used only when the table is doubled upon itself, that is, when exactly the same kind of data appears on both sides of the double rules. This is done in order to break long narrow columns of data. (See Table II.) An open table, that is, a table with no perpendicular lines should not be used for more than three columns of data. (See Table III.) If such a table is long, it is often better to double it upon itself as in Table II.

The following specimen tables are given as illustrations of the forms most commonly used in tabular construction. The first column division is known as "the stub" and consists usually of reading material. The other columns as a rule contain figures.

TABLE I. EXAMPLE OF A SIMPLE TABLE

Test	Form	Grade	Scores	Scorers	Difference

TABLE II. EXAMPLE OF A TABLE DOUBLED UPON ITSELF

Series C			Series C		
City	Number of cases	Percent of cases	City	Number of cases	Percent of cases

TABLE III. EXAMPLE OF AN OPEN TABLE

<i>Name of City</i>	<i>Time of Testing</i>	<i>Number of Tests Given</i>
Boston.....	October.....	3
Chicago.....	February.....	6

TABLE IV. EXAMPLE OF TABLE WITH SUBDIVISIONS

This is the Most Common Form for Subdivisions and Second Subdivisions.

Intelligence Quotients	Achievement Quotients			
	Experimental		Control	
	Beginning	End	Beginning	End

TABLE V. EXAMPLE OF TABLE WITH VARIED DIVISIONS

States	Number of Factories	Numbers of Employees				
		Men	Women	Boys	Girls	Total

(b) **Graphs.** Frequently the effectiveness of one's writing may be increased by presenting certain types of facts in graphical form. Simple diagrams and figures are easily understood by most readers and are especially helpful to those who have difficulty in getting the meaning from the printed page.

When employing graphical methods of expression, accuracy and precision should be observed just as when writing a verbal report. Since excellent treatises on graphical methods are easily accessible, we shall not discuss them in this bulletin but we recommend that a writer become familiar with the rules governing graphic representation before he attempts to apply such methods. Violation of any of the standard rules may result in conveying misleading if not actually erroneous ideas to the reader.

In addition to the rules relating to the form of graphs, there are others which define conventional practices relative to arrangement and

to the labeling of a figure. The caption should always be placed below the graphs and the number should be in Arabic numerals, not Roman. If possible all the labels of the diagram should be arranged so that they can be read when the page is held in one position. A "confused mass" of lines and labels should be avoided, but sufficient identifying and explanatory marks should be included that a competent person will be able to understand the graph without referring to the accompanying text.

14. Explanation and interpretation of tables and graphs. Unless it is certain that a table or graph will be understood easily, the reading of it should be explained in the text of the manuscript, but no extended enumeration of the facts that have been summarized in the table or graph should be given. The interpretation should be confined to those facts that are essential to the discussion of the problem. The reader's "trend of thought" will be broken if his attention is called to items or inferences not related to the particular problem under consideration. Tables and graphs should be considered supplementary to the text and not intimate parts of it. They supply details in a convenient summary form, they also add emphasis, but they do not express a "trend of thought."

15. References to sources of information. When specific facts are used or sentences or paragraphs from another's writings are quoted, it is customary to give in a footnote the source from which such material is taken. This is done for two reasons: custom demands that a writer acknowledge his indebtedness in such cases; and the reference enables the reader to consult the original material if he so desires. Furthermore, the information regarding the source of a statement frequently furnishes the reader with an index of its probable validity and accuracy. Naturally more confidence is placed in data taken from the writings of a person of reputation or from a source carefully edited than from unknown authors or questionable publishers.

16. Bibliographical forms. Whenever a reference is made to the work of another author, sufficient information should be given to enable one not only to locate the material but also to purchase it. Sometimes full information is not given on the publication and in such case the reference cannot, of course, be complete.

All references in either a footnote or a formal bibliography should be given in an approved form. Although slight variations in the order of the items of a reference and in punctuation are found in different authoritative publications, it is highly important that a writer adopt a definite form and follow it consistently. The forms adopted by the

Bureau of Educational Research in its own publications are given on the following pages.

It should be emphasized that the author's name should be copied exactly as it appears, no change of any kind being made in it. If two or more references by the same author occur in the bibliography, his name should appear in the same form in each even though in the actual references initials may have been used in one case and the given names spelled out in another. In a bibliography the references usually should be arranged in alphabetical order according to the names of the authors regardless of the nature of the publications. The illustrations on the following pages give the form to be used for references occurring in footnotes. In a formal bibliography it is customary to have the author's name appear in capitals and small capitals and to indent all lines except the first as has been done in the bibliographies of this bulletin.

The forms listed here as illustrations have been labeled "book reference," "periodical reference," and so forth, so that they may be easily referred to, but the reader should understand that it is not necessary to label a reference as a book, a periodical, or a report, for when a correct bibliographical form is used, this fact becomes evident.

Book references. In a book reference there are usually six items to be included. They should be arranged in the following order: *author or authors, title, place of publication, publisher, date and pages.* If one or more of these items is not given in the publication, the arrangement of those remaining should follow the order stated above. The book references given below show the capitalization and punctuation which should be used. Practices in regard to capitalization and the use of italics vary. The name of the author or authors may be capitalized, or "caps and small caps" may be used as in the following references. In a typewritten manuscript not intended for publication, the names may appear in "all caps." The title of the book should be printed in italics, when it appears in the text or in a footnote, but the underlining which indicates this may be omitted in a manuscript not intended for publication. The title of a book is sometimes not italicized in a lengthy bibliography.

Potter, Milton C., Jeschke, H., and Billet, Harry O. *Oral and Written English, Intermediate Book.* Boston: Ginn and Company, 1921. 270 p.

Terman, Louis M. *The Hygiene of the School Child.* Boston: Houghton Mifflin Company, 1914, p. 345-56.

The first reference gives the correct form for indicating the entire number of pages contained in a book while the second reference gives

the form when a few specific pages are referred to. A reference to a specific section of a book or bulletin has a comma after the date, and for this reason is indicated by p. — rather than — p.

Periodical references. In a periodical reference, the title of the article is inclosed in quotation marks. This at once sets it off from a book reference. The items necessary for complete information should be given in the following order: *author, title, name in full of periodical,¹² number of volume in Arabic figures, number of pages inclusive on which article appears,¹³ month and year of publication.*

The publisher of the periodical is not included in the reference; for if desired for purchasing purposes it may easily be found. The references below show the capitalization and punctuation which should be used, and also give the forms for continued articles, and for editorials.

A single article:

Fordyce, Charles. "Intelligence Tests in Classifying Children in the Elementary Schools," *Journal of Educational Research*, 4: 40-43, June, 1921.

An article continued in separate volumes of a periodical:

Mead, Cyrus D. "Silent Versus Oral Reading with One Hundred Sixth-Grade Children," *Journal of Educational Psychology*, 6: 345-48, June, 1915; 8: 367-68, June, 1917.

An article continued in the same volume of a periodical:

Henderson, Archibald. "Number, and the Fundamental Laws of Algebra," *The High School Journal*, 4: 51-53, 77-80, 171-73; March, April, December, 1921.

An editorial from a periodical:

Courtis, S. A. "Scientific Supervision," *Journal of Educational Research*, 1: 67-68, January, 1920. (An editorial.)

Monograph and bulletin references. In addition to the material appearing in books and periodicals, there is a large quantity usually published by a university, a board of education, or some other organized body. This is called "bulletin material." Usually there are seven items to be given in a reference for a bulletin. These items are the same as those included in a reference to a book with the addition of certain information called *description*, which includes name, volume and number of the series of which the bulletin is a part, and immediately follows the title. The items should be arranged in the following order: *author or authors, title, description, place, publisher, date, and pages.* In case one or more of the items is not given in the publi-

¹²The name of a periodical is italicized the same as the title of a book.

¹³If the writer wishes to refer to certain pages or a page instead of the entire article, these should be given rather than the total inclusive pages.

cation, the others should be arranged in the order stated above. The references of bulletins given here show the proper capitalization and punctuation. All necessary information concerning the publication should be included. It will be necessary to watch closely that no series, names and numbers, volume numbers, and so forth are omitted.

United States Bureau of Education Bulletin:

Capen, Samuel Paul. "Facilities for Foreign Students in American Colleges and Universities," *U. S. Bureau of Education Bulletin*, 1920, No. 39. Washington: Government Printing Office, 1920. 267 p.

Teachers College Contributions to Education:¹⁴

Berkson, I. B. "Theories of Americanization," *Teachers College, Columbia University Contributions to Education*, No. 109. New York: Bureau of Publications, Columbia University, 1920. 226 p.

A school survey:

"An Educational Survey of Janesville, Wisconsin." Madison, Wisconsin: State Department of Public Instruction, 1918. 226 p.

A school report:

"Annual report, 1918-19, Alton Public Schools." Alton, Illinois: Board of Education, 1919. 156 p.

A course of study:

"Synopsis of Courses of Study, 1920-21, in Public Schools." Davenport, Iowa: Board of Education, 1920. 133 p.

Bulletins published by universities and other organized bodies:

Meyer, Harold D. "The Rural Playground," *University of North Carolina Extension Bulletin*, Vol. 1, No. 6. Chapel Hill: University of North Carolina, 1921. 78 p.

Monroe, Walter S. (Edited by)¹⁵ "Studies in Arithmetic 1916-17," *Indiana University Studies*, Vol. 5, Bureau of Cooperative Research Study No. 38. Bloomington: Indiana University, 1918. 40 p.

Holly, Chas. E. "Mental Tests for School Use," *University of Illinois Bulletin*, Vol. 17, No. 28, Bureau of Educational Research Bulletin No. 4. Urbana: University of Illinois, 1920. 91 p.

Shultis, Frank W., and Hellman, J. D. "A Study in Addition," *Colorado State Teachers College Bulletin*, Series 16, No. 3, Research Bulletin No. 1. Greeley: Colorado State Teachers College, 1916. 16 p.

An article within a yearbook or any bound volume:

Baldwin, B. T. "A Measuring Scale for Physical Growth and Physiological Age," *Fifteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1916, p. 20-21.

¹⁴The name of this series appears in various forms. In some cases a comma is inserted after the word *University*, while in others *Columbia University* is omitted.

¹⁵If a reference is edited, compiled or prepared by someone in such a way that he cannot strictly be said to be the author, this fact should be indicated by placing a notation in parentheses immediately following his name.

Miscellaneous material published by boards of education:

Deamer, Arthur. "An Experiment in Acceleration." Fargo, North Dakota: Board of Education, 1918. 32 p.

"The Arithmetical Abilities of School Children as Shown by Courtis Tests," Board of Education, Division of Reference and Research Bulletin No. 1. Cleveland, Ohio: Board of Education, 1917.

Sexton, Elmer K. "Arithmetic Survey in the Public Schools of Newark, N. J.," *Board of Education Monograph*. Newark, N. J.: Board of Education, 1919. 30 p.

Spain, Charles L., Moehlman, Arthur B., and Harrington, H. L. "The Intermediate School in Detroit," *The Detroit Educational Bulletin*, Research Bulletin No. 6. Detroit: Board of Education, 1921. 39 p.

17. Chapter titles, table of contents, preface, title page, spacing, order of paging, paper, and so forth. The chapter title should be concisely expressed and should indicate the purpose of the chapter. The table of contents may be very simple, consisting of only the titles of the chapters, or may be elaborate with subordinate headings and second sub-headings. No definite rules regarding the comprehensiveness of the table of contents can be given. In such material as a thesis or a bulletin in which there is no index, it is probably desirable to list in some detail the divisions and subdivisions of the different parts or chapters.

The preface usually contains acknowledgments of assistance to persons who have given actual aid in the preparation of the manuscript, or whose books and other writings are used as references. In the case of a thesis the term "acknowledgment" is often used instead of "preface." A preface should be simple and dignified, should give some indication of the audience to whom it is addressed, and should contain some statements of the reasons for the writing of the manuscript.

18. Footnotes. Footnotes fulfill three principal functions: (1) to give a bibliographical reference for quoted material or for facts and statements; (2) to qualify or elaborate statements of the text when it is undesirable to include such comments in the body of the manuscript; (3) to suggest further treatment of the subject. Footnotes are apt to be treated more carelessly and inconsistently than any other part of the manuscript. They should, however, receive a writer's careful attention in regard to sentence structure, punctuation, and so forth, and especially in regard to the form of bibliographical references. The illustrative forms given on p. 73ff. should be followed in footnotes. In a formal bibliography it is customary to have the author's name appear in capitals and small capitals and to indent the lines following the first as has been done in the bibliographies at the end of the preceding

chapters of this bulletin. This form of indentation should never be used in footnotes.

19. Miscellaneous. (a) Abbreviations. Abbreviations of words or phrases are not generally considered good form in the body of the report. An exception is often made in regard to titles of persons as "Mr.," "Dr.," or "Prof." No one rule can be given in this case but consistency is urged both in the use and in the selection of the title. For example, "Dr." should not be used in referring to one person, and "Mr." or "Prof." to another of the same rank or position; or the title should not be given in one case, and omitted in another. Furthermore when titles are used, extreme care regarding their correctness should be taken. It may be said that "Professor" is usually written in full, "Doctor" frequently, and "Mister" seldom, if at all. A safe and widely used method is to omit titles altogether, especially if the person has attained prominence. In scholastic circles, however, it is customary to refer to the president of an institution by his title written in full.

(b) Division of words. The unnecessary division of a word at the end of a line should be avoided if possible. Unless objectionable spacing results, it is better to carry the whole word over to the next line. When divisions are necessary, the following suggestions may prove helpful.

Words in general are divided according to the natural divisions in correct pronunciation as *knowl-edge*, not *know-ledge*. Acceptable divisions may be made before such terminations as *ing*, *er*, *est*; immediately following a vowel as *intri-cate*, *mascu-line*; or between the consonants when two consonants occur between two vowels as *ineffective*, *inflam-mable*. In language other than English the most important rule is to divide on the vowel as far as possible. If at all avoidable, two consecutive lines should not terminate in a hyphen.

In the following cases, divisions should never be made: monosyllables, as *weight*, *stopped*; two vowels sounded as one, as *mea-dow*, *peo-ple*; proper names; initials of a person's name; abbreviations as, *Ph.D.*, *A.B.*; or numbers expressed either in Arabic or Roman numerals.

(c) Spelling out numbers. In general, all numbers under one hundred, and all round numbers, as two thousand, five hundred, and so forth should be spelled out. Decimals as money and per cents, numbers over one hundred and those used statistically in enumerations are usually written in figures. Any number, however, used to begin a sentence should be spelled out.

III. DIRECTIONS REGARDING PREPARATION OF MANUSCRIPT

General plan of report formulated in an outline and brief. As a rule the first step in the preparation of a report of educational research should be the formulation of an outline. A writer needs an outline for much the same reason that a contractor needs blue-prints and specifications for a building. The outline serves as a guide as he works upon the various details and enables him to stick to his problem. Although it is usually desirable for a writer to prepare a somewhat detailed outline in written form, this should be followed by a brief. An outline usually consists of separate words or short phrases which announce the topics or points that will be taken up in the report. A brief does more than this; it expresses in abbreviated form the principal statements to be made on each sub-topic or point. Illustrations showing the difference between an outline and the corresponding brief on the topic, "Written Expression as a Type of Learning," are given below.

THE OUTLINE

- I. Relation of Organization of Ideas to Textbook Reading.
- II. Relation of Expression of Ideas to Learning.
- III. Clear Thinking and Expression of Ideas.
- IV. The Brief Compared with an Outline.
- V. Making a Brief.
 - (a) Principal points.
 - (b) Subordinate points.
 - (c) Revision.

THE BRIEF

- I. Organization of ideas supplements the learning resulting from the reading of a textbook.
- II. Expression of ideas is an important learning exercise.
- III. Clear thinking is a prerequisite for effective expression. When one has clear ideas it is usually easy to express them.
- IV. A brief differs from an outline in that it consists of phrases or sentences which express ideas instead of merely words or phrases which announce topics about which something will be said.
- V. The steps in making a brief are:
 - (a) Clearly define your purpose.
 - (b) Formulate the principal and subordinate points of the discussion in complete sentences.
 - (c) Organize these so that they will present a satisfactory "trend of thought."
 - (d) Test each statement for precision and for its relation to the problem being considered.

A carefully prepared brief an aid to writing. A brief is even more helpful to a writer than an outline. It epitomizes his "trend of thought." In the making of a brief, little writing is required, and he has an opportunity to concentrate upon thinking about the problem.

Details may be neglected for the time being. A distinct service which the brief renders is due to the fact that it represents a more advanced stage of thinking about the problem than the outline.

Criteria for good writing should be observed. In preparing the first or working draft of a report, all of the criteria for good writing should be observed so far as possible, but the writer's attention should be focused upon "trend of thought" and "evaluation of ideas." If a brief has been prepared, the general pattern of this "trend of thought" will have been formulated but the details are filled in during the writing of the first draft. As this is done, the writer may find it necessary to make changes in the organization of the report in order to secure an effective "trend of thought." The evaluation of ideas is one of the most difficult tasks which a writer encounters. It is essential to eliminate all irrelevant statements from the report as well as to include everything that should be said.

Paragraph headings. Carefully formulated paragraph headings¹⁶ are now generally used in textbooks, monographs, and bulletins to assist the reader in getting the general "trend of thought." They may assist the writer by providing a series of specific ideas for him to think and write about. If they are to fulfill this function, the writer must formulate them before the following paragraphs are written. If a somewhat detailed brief has been prepared, many of the paragraph headings can be taken directly from it. If a brief has not been prepared, the formulation of the paragraph headings should follow the preparation of the outline. They should not be thought of as something to be inserted after the paragraphs have been written. It is unnecessary and frequently undesirable to have a separate heading for each paragraph. However, whenever a new unit of the discussion is taken up, there should be a paragraph heading which indicates to the reader the nature of the "trend of thought" immediately following and its relation to the problem being considered.

Formation of new paragraphs. In writing, a new paragraph should be formed whenever a new point is taken up or the "trend of thought" changed. If in doubt when writing the first draft it is well to form a new paragraph, as combinations can easily be made in the revision.

Order of writing chapters. In the case of a report consisting of several chapters, it is sometimes desirable to revise the preliminary

¹⁶In printed material paragraph headings usually appear in bold-face type as in this bulletin. To indicate this type in a manuscript a wavy line (~~~~~) is drawn under the heading, but in writing a report it is more convenient merely to underline the headings. However, an author should have in mind that simple underlining indicates italics and if bold-face type is desired in a printed report the straight line must be changed to a wavy line when the manuscript is sent to the printer.

drafts of some of the earlier chapters before writing the later ones. Some chapters even may be left incomplete while other sections of the report are taken up. Some writers have found it undesirable to spend much time over tedious details in the first draft, because when working on details one tends to lose sight of the general "trend of thought." However, there usually comes a time when it is advisable to prepare a complete preliminary draft of the report in order that each part may be judged in its relation to all others.

Physical form of working drafts. In preliminary drafts margins of at least an inch and a half should be left at the top and on the left-hand side. The margins on the right and at the bottom may be somewhat narrower. Some writers find it desirable to have even wider margins. If the draft is typewritten, it should be double-spaced. Only one side of the paper should be written on.

All tables except very short ones should be placed on separate sheets which contain no text so that they can be inserted easily in a revised manuscript. Failure to observe this rule will result in considerable waste of time in copying tables. In order to facilitate insertions and other changes, it is wise to begin each major division and many of the subordinate divisions on a new page. Even in the case of paragraphs it is usually desirable to begin a new page when the preceding paragraph ends in the last third of a page. An exception to this suggestion may be made in the case of a short paragraph which can be completed in the remaining space on the page. Sometimes it is helpful to leave spaces between paragraphs for insertions.

Correct bibliographical forms should be observed in the footnotes of preliminary drafts of a manuscript. Care also should be exercised to spell all words correctly and attention should be given to capitalization, punctuation, and other technical details of form. If this is not done, some of the errors appearing in the preliminary drafts are almost certain to persist in the final form of the manuscript.

The position of footnotes. In the working drafts of a manuscript, the footnotes should be indicated by an asterisk (*) and should appear on the line immediately following that in which the reference is made. A footnote in this position should be separated from the text by triple-spacing or by horizontal lines drawn immediately above and below the footnote.* An exception to this rule is usually made in the

*For example, a footnote given at this point should be placed in this position and set off as indicated.

final form of theses and other manuscripts not intended for publica-

tion. In such cases, the footnotes should be shifted to the bottom of the page in the final typing. In order to avoid confusion when two or more footnotes appear on a page, it is customary to number them consecutively throughout each chapter as has been done in this bulletin. However, some publishers prefer to number the footnotes consecutively on each page.

Final form of a report the product of revision. A well-written report is seldom attained in the first draft, even though a detailed brief has been previously prepared. Most successful writers, even after years of experience, are accustomed to refine their reports through a series of revisions. Occasionally there is a writer who possesses unusual ability in organizing and expressing his ideas and who for that reason is able to produce a creditable report at the first writing. However, such persons are rare and they probably could produce better reports if they carefully revised their manuscripts.

Application of criteria for judging a report, the basis for revision. The process of revising a manuscript involves applying the criteria given on pages 58 to 61 and then making the changes necessary to remove the deficiencies and errors revealed. Thus as a preliminary to the actual work of revision, a writer should attempt to fix these criteria in his mind. However, he should not seek to apply all of them at once. Those given under "general structure," and "development, evaluation and organization of ideas" should receive attention first, as the time devoted to correcting details of structure and form will be wasted if later it is necessary to make major changes.

Re-thinking required. A revision of a manuscript is not accomplished by merely correcting rhetorical and grammatical errors and misspelled words. The definition of the problem and its solution should be carefully retraced for the purpose of improving the "trend of thought," the development and evaluation of ideas, and the precision of statement. A writer should try to approach the task of revising his manuscript with the attitude of a critical reader. Criticizing one's own writing is difficult because one is handicapped in adopting the impersonal and detached attitude which is necessary, but such criticism is essential in the production of good writing. One should therefore cultivate the art of criticism, particularly with reference to the development, evaluation and organization of ideas.

Major reorganizations. Frequently a writer will find it necessary to make certain major changes. The order of certain chapters may need to be interchanged. The position of a paragraph or of a series of paragraphs may need to be shifted. Some paragraphs which were

written only after much effort may prove of so little value that they should be eliminated.

Improvement of sentence structure. Frequently sentences and even paragraphs need to be rewritten in order to secure more effective expression. Sometimes the desired result can be accomplished by varying one's diction. Qualifying phrases and clauses may be shifted, short sentences may be combined and in other cases long ones broken up. Unnecessary shifting of voice, tense or person should be eliminated. A writer should never hesitate to rewrite a paragraph if he feels that he can improve it. Detailed suggestions for improving sentence structure are given in rhetoric texts and manuals for writers.

Correction of errors. The final step in revising a manuscript is to correct all remaining errors of grammar, spelling and punctuation. Much of this work will have been done in the preceding stages of the revision, but there should be a final going over of the entire manuscript for the purpose of eliminating errors of any kind.

Economy of time in revision. The several phases of the work of revising the manuscript should be taken up in the order in which they have been presented in the preceding discussion. As we have already indicated, time is likely to be wasted if some of the later phases are undertaken before the major changes have been made.

A writer should not consume time in unnecessary copying. Frequently scissors and paste can be used to advantage in making changes in the order of a report. Corrections can be written between the lines and on the margins. Insertions can be placed on separate pages with appropriate indications of their positions. It is a waste of time to copy a manuscript before a fresh draft is needed. However, when a critical reading of the manuscript is made difficult or impossible because the changes in it are distracting or confusing, the entire manuscript, except whole pages which are unmutated, should be copied in typewritten form if possible. A fresh manuscript often will stimulate a writer to higher levels of effectiveness in his writing.

IV. GENERAL DIRECTIONS REGARDING FINAL FORM OF MANUSCRIPT

Title page.¹⁷ The title of the manuscript should be written in all capitals and should be placed two inches or more below the top of the page. The author's name should appear in full, placed below the title,

¹⁷In the final typing of a thesis or of a report any rules prescribed by the college or by the department should be carefully followed. The directions listed here are representative of good form and should be observed except in those cases where they conflict with institutional requirements.

and usually preceded by the word "By" written just above. On the line below the author's name, his institutional connection and rank are often given. In a thesis, previous degrees, institutions, and dates should be listed. In a term paper, the title and the author's name should be given as in the description above; the names of the course and instructor in charge may be added, preferably on lines near the bottom of the page.

Table of contents. When a report is divided into chapters with titles, there should be a table of contents which gives the chapter titles preceded by the Roman numerals I, II, III, and so forth. When subordinate headings are given, they should be indented and may be numbered by Arabic figures or by capital letters. In case there are second sub-headings, further indentation should be used and the numbering may be done by means of letters a, b, c, and so forth, or by Arabic figures enclosed in parentheses. The plan of numbering in the table of contents should be the same as that observed in the manuscript. When a report is not formally divided into chapters, it is frequently desirable to give a brief description of the contents. In all cases, the table of contents should appear alone upon the page or even upon successive pages. If brief, it should be so placed as to give approximately equal spacing above and below the written material.

List of illustrations, figures or tables. The list of illustrations or figures should give the titles of the illustrations preceded by the numbers in Arabic as 1, 2, 3; the list of tables should give the captions of the tables preceded by the Roman numerals as I, II. In case a manuscript includes illustrations, figures and tables, separate lists should be given for each.

Spacing. The paper should be of ordinary weight, of uniform size, $8\frac{1}{2}$ by 11 inches, and only one side should be used for writing. The text proper should be double-spaced. Quoted material appearing in a separate paragraph may be single-spaced. The left-hand margin should be from an inch to an inch and one-half. The right-hand margin may be somewhat narrower.¹⁸ The first line of a new paragraph should be indented at least one inch.

First page of text. The first page of the text may or may not contain the title of the manuscript. If the title is given it should be in capitals, and should be dropped about two inches from the top of the page. The word "Chapter," all capitals, followed by the Roman

¹⁸In preliminary drafts of a manuscript it is well to have both margins somewhat wider. Some writers have found it desirable to triple-space the text in order to provide space for insertions and corrections.

numeral, should appear on the line about three spaces below the title of the manuscript. The chapter-title, usually in all capitals also, is placed on the line below the chapter number. The text of the chapter should begin an inch or more below the title. Each new chapter should begin a new page with the number and title written as described for the first.

Order of paging. The pages of the manuscript should be numbered consecutively, and assembled in the following order: (1) title page, (2) preface, (3) table of contents, (4) list of illustrations, figures, or tables, (5) introduction, (6) first page of text, and so forth. If it is necessary to add extra pages to the original, they may bear the number of the preceding page with letters added as 10a, 10b, 10c. If only a short passage is to be inserted, it may be pasted on the margin and folded in. In attaching inserts, pins or paper clips should not be used as they are apt to work loose. In case the insertion consists of a few words or of a short sentence, it is probably advisable to use a caret and write in the space above or in the margin. If certain pages are withheld or dropped for any reason, an indication of this should be given on a sheet bearing the omitted numbers.

Form of footnotes. In general, the rules for complete sentence structure, punctuation, and so forth, apply to footnotes as to other portions of the manuscript. Abbreviations, however, such as "art." (article), "chap." (chapter), "fig." (figure), and "vol." (volume), not acceptable in the text, may be used.

Bibliographical references should be given in the regular form. (See p. 72ff.) When references to the same work follow each other closely and uninterruptedly on the same page, *ibid.* (an abbreviation of *ibidem*, same) may be used. If, however, the page has been turned, it is necessary to repeat the entire reference or to use simply the author's name followed by *loc. cit.* (*loco citato*, in the place cited) or *op. cit.* (*opere citato*, in the work cited). For example:

Bloomfield, Meyer. *Youth, School and Vocation*. Boston: Houghton Mifflin Company, 1915. On the same page, *ibid.*; on the following page Bloomfield, *loc. cit.* or Bloomfield, *op. cit.*

No one rule can be given for the numbering of footnotes. The best plan, probably, is to give consecutive numbers throughout a chapter, or throughout the entire report if no important divisions are made. Footnotes to tables or to figures should be placed at the foot of the table both in the typewritten manuscript and on the printed page. Small letters, asterisks, daggers, and so forth are usually used to indicate footnotes in such cases, since figures might cause confusion.

